

HIGH SCHOOL GEOGRAPHY



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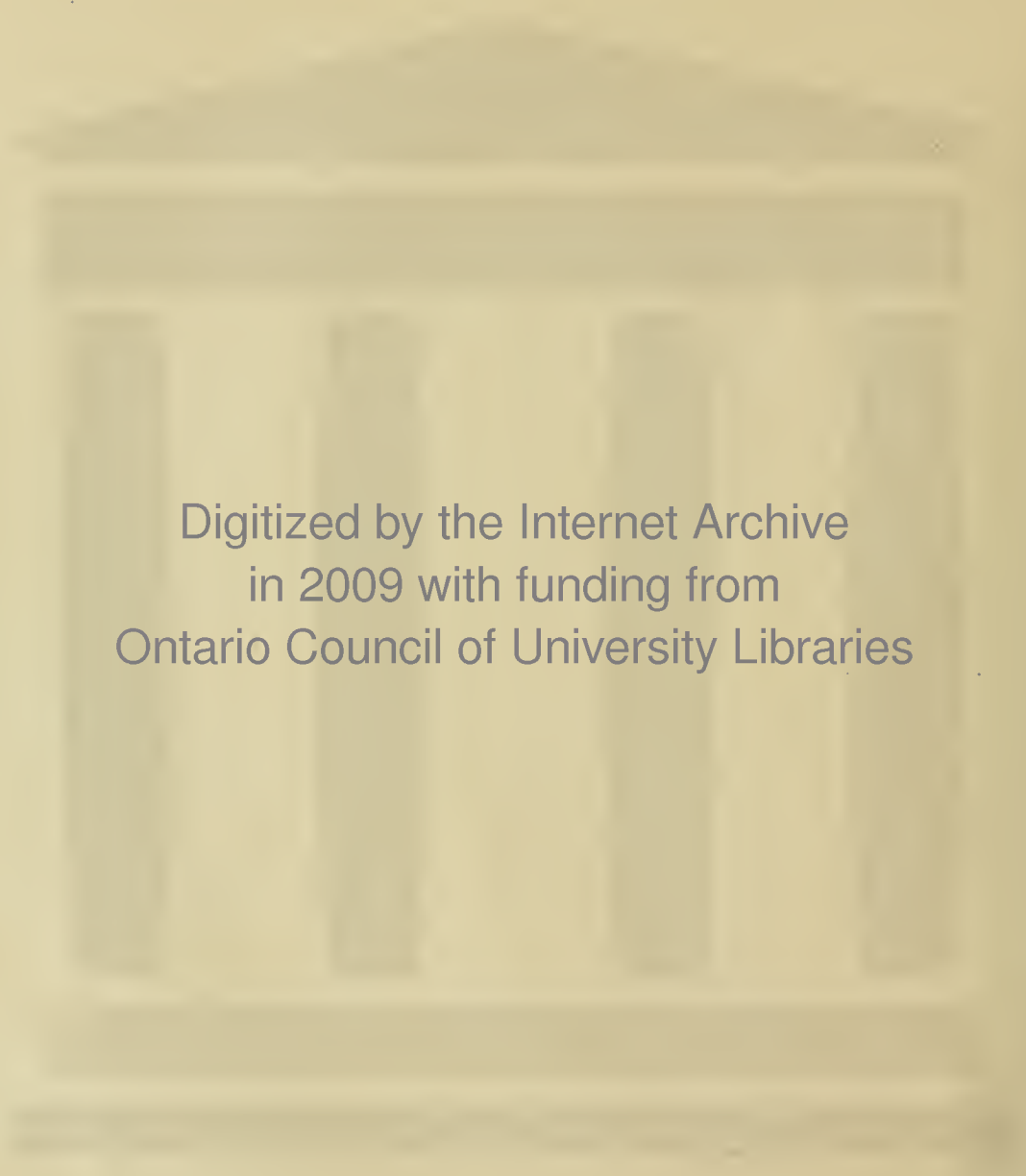
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HIGH SCHOOL
GEOGRAPHY

WITH
MAPS AND ILLUSTRATIONS

PART I., PHYSICAL; PART II., DESCRIPTIVE

By G. A. CHASE, B.A.

AUTHORIZED FOR USE IN THE HIGH SCHOOLS AND COLLEGIATE INSTITUTES BY THE
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PREFACE.

IN the preparation of this book an attempt has been made to keep steadily before the learner the important fact that upon physical or geological structure, together with the character of exposure to climatic influences, depend all or nearly all the phenomena of our earth; in other words an attempt has been made to give a scientific direction to the study of geography, itself so scientific a subject.

The material has been obtained from many sources, and is the latest and best. For Part I. the latest works of Sir Charles Lyell, Sir J. W. Dawson, Professor Geikie, Professor Dana, Professor Huxley and others have been especially consulted. In Part II. the statistics have been drawn altogether from the latest official documents; the descriptive portion comes from many sources, including numerous books by competent authors dealing with particular countries, the eminently scientific works of Dr. A. R. Wallace, articles in Encyclopedias and magazines, and official publications; from the last mentioned has been procured almost all the information regarding the possessions of Great Britain,—Australia, New Zealand, South Africa and India, as well as Canada itself.

The seeker after accurate information about countries and regions beyond the influence of the active modern life of central and western Europe, North America and the British colonies generally, soon becomes aware how little is really known of by far the greater part of the earth's surface.

As this book is intended for Canadian schools, naturally the space in it devoted to Canada is altogether out of proportion to Canada's relative importance in the world. This is particularly the case with the Maritime Provinces, including Newfoundland; but so great is the ignorance regarding these provinces, even among intelligent people of the inland portions of the Dominion, that a comparatively full description of them was deemed a necessity. The United States, so closely connected with us by ties of blood and intercourse, also required a detailed description. To the "mother-land" a greater space was at first proposed to be given, but so much had to be said about the "Greater Britain" in various parts of the globe, that the relative prominence actually bestowed upon the United Kingdom in the description of Europe was regarded, on the whole, as sufficient.

It is to be regretted that the requirements of a school-book, in reference to size, have in many cases necessitated

a more limited description than could be desired; but it will be found that the general description of each continent, or part of a continent, in giving a comprehensive view of the whole, and thus rendering necessary only the filling in of minor details as each country passes under review, has reduced to its smallest proportions an evil in itself unavoidable. By this means, also, repetition has been made unnecessary.

Lists of capes, islands, etc., etc., that form so large a part of our ordinary text-books on geography, and that are so destructive to the interest and utility of the subject, will not be found in this book. Such things can best be learned by looking for their position on some good wall-map as they are met with in the course of ordinary reading; they thus are associated with some items of interest and become a part of ordinary intelligence. Neither will any "questions" be found appended—those insults to the intelligent teacher!

In the Appendixes will be found much valuable information that it was not deemed advisable to insert in the body of the book; this should be taken up concurrently with the study of the countries referred to.

The author earnestly hopes that teachers will persistently and systematically apply to the study of each particular country the principles laid down in Part I.; and also that they will not limit their own knowledge to what is contained in this book, but that they will read widely so as to be able to give additional information, to illustrate still farther, and to correct whatever may be found inaccurate.

Scarcely any book has been written which its author would not change in some details, if, with his acquired experience, he had to do the work over again. The present book is no exception to the rule; but whatever in this case might be done in respect to word or expression, in contraction here and expansion there, the principle and plan would remain unaltered.

The author's lack of training in reading proof, and the scarcity, even in our capital city, of competent professional proof-readers, will account for some of the "clerical errors" that will doubtless be discovered,—defects which can be easily remedied in a new edition, but which, it is to be hoped, the character of the book in other respects will cause to be overlooked.

THE AUTHOR.

TABLE OF CONTENTS.

PART I.

	PAGE.
BUILDING UP OF THE EARTH	1-5
Soil: Rocks	Par. 1
Stratified Rocks	2
Strata, Elevation of	3
Strata, Succession of	4
Periods of Life on the Earth	5
First Period—Eozoic	6
Second " —Palæozoic	7
Third " —Mesozoic	8
Fourth " —Cainozoic	9
Post Tertiary (Post Pliocene) Period	10
Man	11
Unstratified—Igneous or Plutonic Rocks	12
Metamorphic Rocks	13
Earlier State of the Earth: Nebular Theory	14
LAND SURFACE OF THE EARTH	6-18
Upheaval of Strata by Contraction of the Earth	Par. 1
Causes Modifying Form of Land: Modifying Agents—Rain, Rivers, Frost, Heat, Ice, Waves, Volcanic Action, Sediment, Springs, Winds	2
Forms of Land Surface: Distribution of Land	3
Continents—Structural Plan	4
Mountains, Importance of	5
Mountains, Characteristics of	6
Mountains, Appearances of	7
Dependence of Soil upon Strata	8
Volcanoes	9
Volcanic Phenomena	10
Volcanoes, Arrangement of	11
Volcanoes, Causes of	12
Valleys	13
Plateaus	14
Plains Proper	15
Islands—Continental	16
Islands—Oceanic (Volcanic, Coral)	17
Coral Reefs	18
<i>Waters of the Land:—</i>	
Rivers, Origin of	19
" Size of	20
" Sources of	21
" Currents of	22
" Windings of	23
" Erosion of	24
" Waterfalls and Rapids of	25
" Deposition of Sediment by	26, 27
" Rapidity of Denudation by	28
" Utility of	29
Lakes, Origin of	30
" with no Outlet	31
" Destruction of	32
" Economy of	33
Springs, Origin of	34
" Temperature of; Hot Springs	35
" Mineral	36
THE OCEAN	18-24
Position, etc.	Par. 1
Different Oceans	2
Offshoots	3
Character of Floor	4
Material of Floor	5
Depth near Shore	6
Temperature	7

	PAGE.
Waves	Par. 8
" Size and Rapidity of	9
" Force of	10
" Earthquake	11
Tides, Causes of	12
" Number of	13
" Spring and Neap	14
" Height of	15
" Phenomena of	16
Currents of the Ocean	17
" Causes of	18
" Warm	19
" Periodical and Local	20
" Cold	21
" Phenomena of	22
THE ATMOSPHERE	24-33
Air, Importance of	Par. 1
" Composition of	2
" Importance of Composition of	3
" Weight of	4
" Density of	5
" Changes in Pressure of	6
" Heat of	7
How the Earth is Warmed	8
Moisture of the Air	9
Condensation of Vapor—Dew, Frost, Mist or Fog, Clouds, Rain, Snow, Glaciers, Sleet and Hail	10
<i>Movements of the Air:—</i>	
Winds, Causes of	11
" Constant	12
" Trade	13
" Causes of Direction of	14
" Calms	15
" Periodical; Monsoons	16
" Land and Sea Breezes	17
" Local	18
" Variable	19
" Order of	20
Storms, Causes of	21
" Phenomena of	22
Climate	23
<i>Causes Affecting Climate:—</i>	
Curvature of the Earth	24
Length of Day and Night	25
Winds	26
Ocean Currents	27
The Sea	28
Mountains	29
Land	30
Climatic Belts	31
Isotherms	32
ORGANIC LIFE	33-42
<i>Vegetable Life:—</i>	
Conditions of	Par. 1
Zones of Vegetation	2
Vegetation on Mountains	3
Oceanic Plant Life	4
<i>Animal Life:</i>	
Dependence on Vegetation	5
Development	6
Distribution: Regions of	7
Oceanic	8

		PAGE.			PAGE.
<i>Man:—</i>			PRINCE EDWARD ISLAND.....		96-97
Dependence on Natural Productions	Par. 9	9	MANITOBA AND THE NORTH-WEST.....		98-101
Affected by Physical Conditions	10	10	BRITISH COLUMBIA.....		102-106
Effects on Physical Conditions	11	11	NEWFOUNDLAND.....		107-111
Types of.....	12	12	Position and Extent	Par. 1	1
As to Religion.....	13	13	Geological Features	2	2
Socially and Commercially	14	14	Minerals	3	3
In Nations and Governments	15	15	Outline	4	4
Relationship of Countries.....	16	16	Coast Waters	5	5
THE EARTH AS A PLANET.....	43-46		Banks.....	6	6
The Earth's Shape.....	Par. 2	2	Rivers.....	7	7
" Size	3	3	Lakes	8	8
" Motions—Diurnal	4	4	Climate	9	9
" " Annual	5	5	Vegetation	10	10
Inequality of Day and Night	6	6	Animals	11	11
Why Earth's Motion is Circular.....	7	7	Industries	12	12
Distance of Earth from Sun	8	8	Trade	13	13
The Planets	9	9	Routes	14	14
Direction, Distance, Time	10	10	Towns.....	15	15
Maps of the Globe, etc.....	11	11	Inhabitants	16	16
PART II.			Education	17	17
THE NEW WORLD.....		17	French Territory.....	18	18
NORTH AMERICA.....		48-135	LABRADOR.....	111-112	
Structure: Rocky Mountains	Par. 1, 2	2	UNITED STATES.....	112-134	
Minerals	3	3	Extent.....	Par. 1	1
Outline	4	4	Physical Character.....	2, 3	2, 3
Coast Line.....	5	5	Minerals	4	4
Capes.....	6	6	Farm Products.....	5	5
Peninsulas.....	7	7	Forest.....	6	6
Isthmuses	8	8	Fisheries.....	7	7
Islands	9	9	Manufactures.....	8	8
Coast Waters	10	10	Shipping.....	9	9
Rivers.....	11	11	Trade.....	10	10
Lakes	12	12	Inhabitants.....	11	11
Climate	13	13	Education	12	12
Moisture.....	14	14	Government	13	13
Vegetation.....	15	15	Natural Sub-Divisions.....	14	14
Animals	16	16	EASTERN OR ATLANTIC DIVISION.....		118-120
Industries	17	17	Surface.....	Par. 15	15
<i>Political Divisions:—</i>			Appalachian Mountains.....	16	16
DOMINION OF CANADA.....	58-106		Minerals.....	17	17
Extent, etc.....	Par. 1	1	Coast Features.....	18	18
Geological Structure: Laurentian Plateau	2	2	Coast Waters.....	19	19
Surface.....	3	3	Rivers.....	20	20
Minerals	4	4	Lakes	21	21
Coast Line.....	5	5	Climate.....	22	22
Islands	6	6	Productions, etc.....	23	23
Coast Waters	7	7	Political Sub-Divisions.....	24	24
Rivers	8	8	NEW ENGLAND.....		122-124
Lakes	9	9	Characteristics.....	Par. 26	26
Climate	10	10	Maine.....	27	27
Vegetation.....	11	11	New Hampshire.....	28	28
Animals	12	12	Vermont.....	29	29
Industries	13	13	Massachusetts.....	30	30
Agriculture.....	14	14	Rhode Island.....	31	31
Fisheries	15	15	Connecticut.....	32	32
Forest	16	16	MIDDLE ATLANTIC STATES.....		125-128
Mine	17	17	Characteristics, etc.....	Par. 33	33
Manufactures	18	18	New York.....	34	34
Commerce	19	19	New Jersey.....	35	35
Revenue	20	20	Pennsylvania.....	36	36
Commercial Routes	21	21	Delaware.....	37	37
Political Divisions	22	22	Maryland.....	38	38
Government	23	23	Virginia.....	39	39
Inhabitants, Education, etc.....	24	24	District of Columbia.....	40	40
ONTARIO.....	65-73		SOUTH ATLANTIC STATES.....		128-130
QUEBEC.....	74-83		Characteristics, etc.....	Par. 41	41
NEW BRUNSWICK	84-89		North Carolina.....	42	42
NOVA SCOTIA	90-96		South Carolina.....	43	43
			Georgia.....	44	44
			Florida.....	45	45

TABLE OF CONTENTS.

<i>Political Divisions</i>	PAGE.
Brazil	145-147
Guiana	Par. 19
Venezuela	20
Columbia	21
Ecuador	22
Peru	23
Bolivia	24
Chili	25
Argentine Confederation	26
Uruguay, Paraguay	27
	28

EASTERN HEMISPHERE.

INTRODUCTORY	148
EUROPE	149-173
Extent	Par. 1
Structure	2
Mountains	3
Minerals	4
Plains	5
Outline	6
Peninsulas	7
Capes	8
Islands	9
Coast Waters	10
Rivers	11
Lakes	12
Climate	13
Vegetation	14
Animals	15
Industries	16
Governments	17
Inhabitants	18
Religion	19
Education	20
Political Divisions	21
GREAT BRITAIN AND IRELAND	155-163
Structure	Par. 1
Minerals	2
Climate	3
Vegetation	4
Industries	5
Revenue	6
Army and Navy	7
Routes	8
Government	9
Education	10
Population	11
Religion	12
ENGLAND AND WALES	157-159
SCOTLAND	161
IRELAND	161-163
NETHERLANDS	163
BELGIUM	163-164
SPAIN AND PORTUGAL	164-165
SWITZERLAND	165
ITALY	165-166
DENMARK: ICELAND	166
GERMANY	167
AUSTRIA-HUNGARY	167-169
TURKEY: DANUBIAN STATES: GREECE	169-170
RUSSIA	171
NORWAY AND SWEDEN	171-172

TABLE OF CONTENTS.

vii.

	PAGE.		PAGE
ASIA.....	172-181	<i>Political Divisions:—</i>	
Extent.....	Par. 1	EGYPT.....	185-186
Physical Features.....	2	NUBIA, ABYSSINIA, SOUDAN, SOUTH CENTRAL AFRICA,	
Mountains.....	3	CONGO FREE STATE, THE COASTS.....	186
Plains.....	4	SOUTH AFRICA:—CAPE COLONY, NATAL, ORANGE	
Deserts.....	5	FREE STATE, TRANSVAAL.....	186-187
Minerals.....	6	OCEANIA.....	187-192
Outline.....	7	AUSTRALASIA: AUSTRALIA.....	187-190
Islands.....	8	Extent.....	Par. 1
Coast Waters.....	9	Physical Features.....	2
Rivers.....	10	The Coast.....	3
Lakes.....	11	Rivers.....	4
Climate.....	12	Climate.....	5
Vegetation.....	13	Vegetation.....	6
Animals.....	14	Animals.....	7
Inhabitants.....	15	Inhabitants.....	8
Government.....	16	Industries, Colonies, etc.....	9
<i>Political Divisions:—</i>		Cities.....	10
TURKEY.....	175-176	Tasmania.....	11
ARABIA.....	176	MALAY ARCHIPELAGO.....	190-191
PERSIA.....	176	Physical Features.....	Par. 1
BILUCHISTAN.....	176	Climate.....	2
AFGHANISTAN.....	176-177	Forests.....	3
INDIA.....	177-179	Animals.....	4
INDO-CHINA.....	179	Minerals.....	5
CHINESE EMPIRE.....	179-180	People.....	6
JAPAN.....	180-181	<i>Chief Islands:—</i>	
SIBERIA AND CENTRAL ASIA.....	181	Sumatra, Java, Borneo, Celebes, Philippines.....	7-11
AFRICA.....	181-187	MELANESIA.....	191 192
Extent.....	Par. 1	Characteristics, People, Productions, Animals, etc.....	Par. 1
Physical Features.....	2	New Guinea.....	2
The Deserts.....	3	New Britain, New Ireland, Solomon Islands.....	3
Minerals.....	4	Fiji.....	4
Coast.....	5	Tonga, Samoa, Marquesas, New Hebrides, New	
Islands.....	6	Caledonia.....	5-7
Rivers.....	7	MICRONESIA.....	192
Lakes.....	8	POLYNESIA.....	192
Climate.....	9	NEW ZEALAND, SANDWICH ISLANDS, NOR-	
Vegetation.....	10	FOLK ISLAND.....	192
Animals.....	11		
Inhabitants.....	12		
Religion.....	13		
Commerce.....	14		

PHYSICAL GEOGRAPHY.

BUILDING UP OF THE EARTH.

1. **Soil.**—Everywhere the land surface of the earth is found covered with a fine loose material, generally termed *soil*, consisting for the most part of mineral, or inorganic, matter—the product of the decay of rocks—along with a varying, though small, percentage of organic matter—the remains of plants and animals.

Rocks.*—Beneath this soil, at varying depths and extending to an unknown distance downward, are firm, hard masses, usually called *rock*. These often rise above the surrounding country, forming hills and mountains. The rocks exposed to view in different cliffs, quarries, cuttings, etc., are found to be of two distinct kinds: one, lying in beds or layers, often curved, tilted, or contorted in various ways; the other, consisting of masses without definite shape, but having internal characteristics quite different from the first. The rocks of the first kind are said to be *stratified*,† those of the second, *unstratified*. Examples of the former are seen in the *limestones* of Niagara, Guelph, and Kingston; of the latter, in the *granite* of the north shore of Lake Superior, and of the White Mountains, and in the *trap* of Montreal and Belœil Mountains.



FIG. 1.—A shows stratified rocks in various positions and in different layers; B, unstratified rocks.

2. **Stratified (or Sedimentary) Rocks.**—After a rain-storm we see at the foot of every hill layers of earth, sand, etc., that have been washed down and spread out by the water. We know that dams fill up, that shallows form in still parts of rivers, and that the material producing these effects is derived from the waste of the land

around; we see, also, the waves of sea and lake washing away the shores more or less rapidly, and we know that the solid matter thus removed must be deposited elsewhere. Each little bed of *sediment* left by running water has peculiar markings—furrows, ridges, and veins; here a little layer of coarse sand, there fine sand, and again a layer of mud; and from the bottom of each little dried-up pool we can lift the fine sediment in a thin cake that will often sub-divide more than once. Such is the case also on every sediment-covered shore.

Moreover, in this sediment we find embedded the remains of plants and animals that live in the water, and also, occasionally, the remains of plants and animals belonging to the land. Hundreds of people are lost every year at sea, and trees and smaller plants and dead bodies of animals are carried away by tides, and finally sink; and we know that some of these will be buried beneath the sediment of the sea-floor.

The stratified rocks present appearances similar in every respect to those of the beds of sediment forming now in shallows and at the bottom of lakes and seas; the petrified remains—*fossils*—of both sea and land animals and plants are abundant in them; the marks of running water, and the tracks of animals, are as clear as those on sediment-covered shores to-day. By no other processes than by those going on now could these stratified rocks have been formed.

3. **Elevation of Strata.**—The great pressure to which the beds of sediment were subjected by their own weight and that of the overlying sea, turned them into rock. The ground is never at rest, although the motion may be imperceptible. The south and west of Greenland, west-central Europe, part of the coast of the United States, and many other places are known to be slowly sinking; while Newfoundland, the coast of the Gulf of

* Under the term *rock*, geologists include soil, sand, gravel, and all the loose material as well as the more solid matter.

† From the Latin *stratum*, a layer or bed.

Mexico, and parts of Norway, Sweden, and Scotland are known to be rising. Other places, in Italy especially, have sunk and risen again more than once within historical times. So also in former ages; the ground rose and sank, and in the process countless ages elapsed. One stratum rose, in part or in whole, from the water and became land, and was subjected to the wasting influences of heat and cold, rain and sun, running water and beating waves, and thus furnished sediment for new strata, as other land had for it.

4. Succession of Strata.—But after the lapse of ages the old stratum again sank and the newer one rose; the former received a new deposit of sediment and remains of sea or land animals. And thus the process went on, alternate rising and sinking again, until the earth as we have it now was built up. But each new stratum, though deriving its sediment from a former one, had characteristics of structure, and fossil remains distinguishing it from those below it and from the source of its sediment.

PERIODS OF LIFE ON THE EARTH.

5. A careful study of the stratified rocks has led geologists to recognize four distinct periods in the history of life on the earth. These periods are indicated by an abrupt and almost total change in the character of the fossils in the adjacent beds of each,—showing an equally great change in the physical conditions of the earth. Though each period has strata differing widely in character, yet some types of fossil remains are common

to all the strata of that period; and though each period and each stratum shows a distinct advance in animal and vegetable life, yet animals and plants of the lowest class are found in each. Along with man at the present day exist forms of animal life hardly to be distinguished from plants, and microscopic in size; while moss, mildew, and

mold live in the same air as the highly organized oak and maple.

6. First Period—Eozoic, or “Dawn of Life.”—In the strata of this period no plants have as yet been detected, and the one species of animal was of the simplest kind—a mass of jelly enclosed in a thin shell. The Laurentian rocks of Canada, north of the St. Lawrence, and stretching off from the Thousand Islands toward the west, belong to this early age.

7. Second Period—Palæozoic, or “Old Life.”—Beginning with the humblest corals, shell-fish, and seaweeds, the life of this period passes upward into fishes, insects, and lizard-like reptiles; and into land plants, from the lowly mosses to such as the huge cone-bearing trees and the gigantic palms and ferns of the coal measures. (See Diagram.) To this period belong the limestone rocks, so

abundant in Ontario, seen at Niagara, Hamilton, Guelph, Kingston, and elsewhere, the fossil remains of which are corals and shell-fish especially. (See Figs. 3, 4, 5.)

The most important system of strata of this period is the *Carboniferous*,* for it contains almost all the great “coal measures,” so

* So called from the great luxuriance of its vegetation.

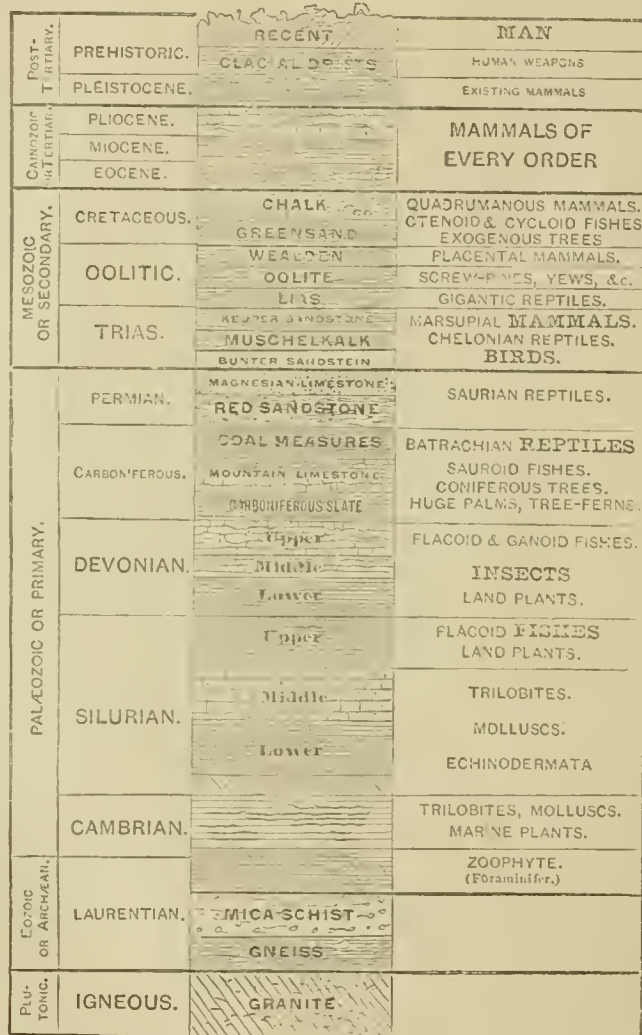


FIG. 2.—DIAGRAM OF THE SUCCESSION OF STRATA AND LIFE ON THE EARTH.

necessary at the present day as a source of fuel. Coal is known to be the product of luxuriant vegetation in a moist, if not hot, climate, and in swampy ground. Generation after generation of plants grew and died, and in decaying formed beds of peaty matter, which were afterwards covered up by deposits of sand and gravel, and sinking beneath the sea were converted by pressure into coal.*

8. **Third Period—Mesozoic, or "Middle Life."**—The lower life of the Palæozoic, or "Primary," period has almost wholly passed away, and in its stead a higher variety appears—mammals, animals that suckle their young; reptiles, which reach their greatest development, some to a most gigantic and formidable size, such as

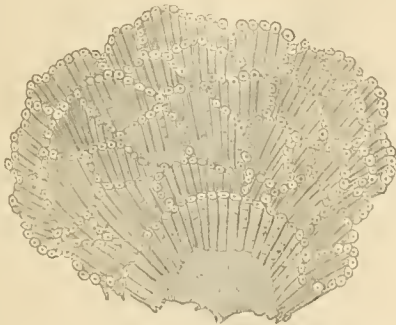


FIG. 3.—FOSSIL CORAL (PALÆOZOIC).

the Ichthyosaurus, or fish-lizard, and the Plesiosaurus.*

Now, too, appear for the first time *erogenous* trees—those that have two-lobed seeds and a separable bark.

9. **Fourth Period—Cainozoic, or "New Life,"** often called the TERTIARY period.—Again another new life appeared; the plants and animals resembled in some respects those of our modern world. The forests contained beeches, oaks, elms, etc.; the characteristic animals were mammals, often of a huge size: birds and reptiles, resembling those of the present day, became more and more numerous. This period was further marked by great volcanic activity.

10. **The Post-Tertiary,† or Post-Pliocene Period.**—America, north of the parallel of 40°, and Europe, north of 50°, are covered over with a loose material consisting of clay, sand, gravel, and boulders. The latter are of various sizes—some angular, some rounded and smooth, some belonging to the underlying rocks, or to those of the neighboring regions; but others of a totally different character, unlike any within known distances. Besides, this material contains remains of animals of both sea and land that are now found only in arctic regions, such as the reindeer, musk-ox, polar bear, arctic fox; or that

are extinct, but whose character fitted them for a cold climate, such as the woolly rhinoceros, the Irish stag, and the mammoth—the remains of the latter, with flesh and skin and hair complete, being found at the present day embedded in the frozen soil of Siberia. Moreover, the boulders and the harder rocks beneath are grooved and scratched in the same way as are the rocks and boulders by the glaciers of Switzerland. Icebergs are known to carry great masses of rock and rubbish from their native mountains far off into the ocean, and glaciers bring down from the mountains long lines, called *moraines*, of similar materials, and deposit them in the plains. From these facts it is inferred that after the strata of the Tertiary period had been deposited a great change took place in the regions indicated—indeed in both the southern and the northern hemisphere. Some geologists think that the land sank beneath the sea—all except the higher mountains,—while the northern, or arctic, part rose high above the waters, and in greatly increased area. Previous to this the climate had been everywhere warm, if not tropical, as is shown by the coal and the fossil tropical plants that are found in the rocks of Greenland. Now, however, the climate became cold; glaciers formed in the exposed mountains and the arctic land, and sent off icebergs with loads of boulders and rubbish to be deposited on the recently submerged land often a thousand miles away. The glaciers scratched and polished the bed rock, tore up and ground down boulders into mud, while the icebergs,



FIG. 4.—LIMESTONE (NIAGARA), WITH FOSSIL STEMS OF CRINOIDS (PALÆOZOIC).

striking the bottom of the sea, scored and grooved the rock as they drifted onward with the currents. Other geologists suppose that one vast sheet of ice covered the

* See Figs. 26 and 28.

† This is a sub-division of the Tertiary, but its characteristics are such as to mark it off as a period by itself.

whole of these regions as it does Greenland now, and that it was the slow southern movement of this ice that left behind it all these marks of its former existence.

These new physical conditions, of whatever peculiar kind, would of necessity be followed by the disappearance of almost all the animals and plants of the former age, and the appearance of others; hence the character

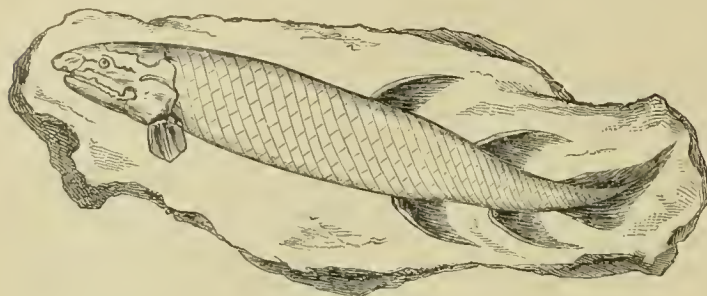


FIG. 5.—FOSSIL FISH (PALEOZOIC).

of the remains in the glacial drift is different from that of the fossils in the rocks beneath. Re-elevation and re-subsidence of the same land, accompanied by retreat and re-advance of the ice, are also inferred from other appearances, among which old sea beaches, now far inland, or far above the water, are very common.

In the course of time, measured by ages not by years, took place the last elevation of the land and the retreat of the ice, followed by the gradual introduction of the state of things that we have now, the glaciers of the Pyrenees, of Switzerland, and of Norway being lingering remnants of the bygone age.

Such is the *Glacial Theory*.

11. **Man.**—But before the arctic climate and animals had disappeared, man came on the scene; for in the *glacial drift*, in positions such as could imply co-existence alone, stone implements and the bones of man have been found associated with the remains of arctic animals;—a fact which shows that the existence of man on the earth dates from a period indefinitely remote.

Only by observing in modern waters the rapidity of deposition of sediment can we form any estimate of the lapse of time in geological ages: even the estimate can at best be only roughly approximate.

Such is the story of plant and animal life on the earth as told by the unstratified rocks. But there is an older life still, that of the earth before the time of stratification; its story is more uncertain, for we have few attainable facts from which to deduce that story.

12. Unstratified, Igneous, or Plutonic Rocks.*—

At the present day volcanoes in various parts of the world throw out melted matter that runs down the sides of the mountains, filling up cavities and spreading out over the stratified rocks in the valley below. (See "*Land Surface of the Earth*," sections 9-12.) This melted matter, or *lava*, when it cools is found to be unstratified rock. So, when rock of a similar character, having a similar position in reference to stratified rocks, is found remote from existing centres of volcanic activity, geologists infer that it also was ejected in a molten state from a volcano. Rock of this kind is supposed to have been, for the most part, ejected by submarine volcanoes, and the name *trap* has been given to it. It often takes the form of masses of jointed regularly-shaped pillars, or columns, and is then called *columnar trap* or *basalt*. Other unstratified rock, called *granite*, found in huge masses, and in veins traversing stratified rocks, is thought to have solidified from the molten state before reaching the surface of the earth. This rock is found underlying all others, and in consequence is regarded by many as the earliest formed rock of the earth's crust.

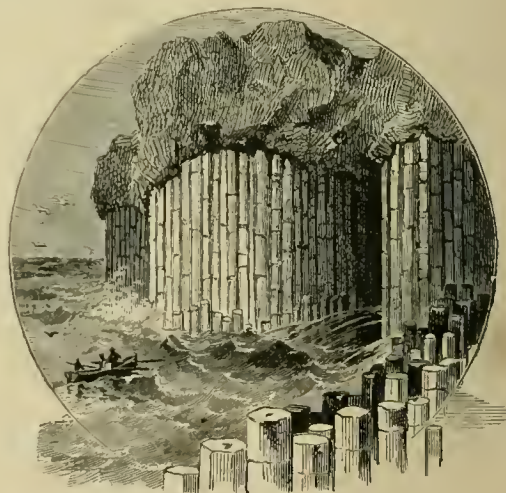


FIG. 3.—FINGAL'S CAVE (COLUMNAR BASALT), SCOTLAND.

13. **Metamorphic (or Changed) Rocks.**—Where veins, or *dykes*, of igneous rock have traversed strata of sedimentary rock, the parts of the latter adjacent to the

* *Igneous*, or *Plutonic*, is a name applied to these rocks in consequence of their being formed directly from molten matter; *Plutonic*, however, is usually applied to granite alone.

former are found to be very much altered in character; they have become vitreous or crystalline, and their fossils have been, in most cases, obliterated. Thus, limestone is seen to have been turned into marble, sometimes retaining its fossils. The Laurentian rocks, the lowest of the stratified group, are of this altered character also; the plutonic granite underlies them, and heat from this is supposed to have effected the change.

The grandest and wildest mountain scenery in the world is found among these *metamorphic* rocks. (See "Land Surface of the Earth," sec. 7, and Fig. 13.)

The order in which the strata occur is always that indicated in the diagram; no palæozoic stratum, for instance, changes place with another. But intervening strata are often absent. The "glacial drift" in Ontario lies on the top of the Laurentian and the older palæozoic rocks, while there is a total absence of mesozoic and Cainozoic formations. In New Brunswick the carboniferous rests upon lower Silurian strata; in Nova Scotia it rests in one place upon upper Silurian, and in another upon Devonian: where all four strata occur, the order is as in the diagram.

The absence of strata is accounted for in two ways: the Laurentian, after it rose from the water may never have sunk again, and so could receive no deposit; this may have been the case with others, or, they may have sunk again beneath the sea and after receiving a new deposit, have risen and lost it again by *denudation*. (See "Land Surface of the Earth," sec. 2.)

14. Earlier state of the Earth—The Nebular Theory.—The material for the first stratified rocks must have been derived from some pre-existing material. Deepest down, and underneath all other rocks, there is found *granite*, an unstratified rock, the result of matter in a molten state.

Whence came this matter? What was the original state of the earth? In digging mines and in boring deep wells, a point is reached at which the temperature is always the same; beyond this point the heat steadily increases; at last it must become so great as to melt all known substances. Hot springs and volcanoes also seem to prove the existence of great internal heat.

If, as everything seems to indicate, the oldest rocks—those from which stratified rocks obtained their material—are the result of the cooling of melted matter, and were the earliest formed, then, geologists argue, the earth must have been once a mass of molten matter, and volcanoes show that deep within the earth molten matter still exists, but whether occupying the whole of the interior or only a part of it in the shape of great oceans of fire, is still a disputed question. (See "Land Surface of the Earth," sec. 9.)

The earth is known to be giving off more heat than it receives; this it has always been doing, conse-

quently the earlier the period the greater the heat of the earth. We can thus imagine the earth to have been a mass of liquid fire, and even a mass of vapor,—which is the form matter assumes under intense heat.

Astronomers, through their telescopes, have observed in the heavens huge masses of faintly shining cloudy matter, or "of glowing, or incandescent gas," one of the gases, on account of the peculiar properties of its light, being known to be hydrogen, a chief component of water. From the two facts, that matter under intense heat assumes the form of vapor—the vapor of each substance having its own peculiar properties,—and that huge luminous masses of vapory, or cloudy, matter termed *NEBULÆ* exist in the heavens, many eminent scientific men believe that the earth, and the sun, and all the planets once formed a nebula, and that through countless ages it gradually cooled down, throwing off, from time to time, great masses, that afterwards, on cooling, formed the earth, the sun itself, and the other planets; some of these, as the moon, having lost all heat; some, as Venus and Mars, being in nearly the same state as the earth; others, as the sun and Neptune, being in the fiery, or the molten, cloud-covered condition.*

This "nebular theory," as it is termed, is but a theory, not a *fact* as the teachings of the stratified rocks are facts: the utmost that can be said of it is that it is possibly true, and that many of the late discoveries in science tend to support the theory—the most important being those made by means of the *spectroscope* which go far to prove that the sun, the planets, and the stars, are identical in composition with the earth. (See "Earth as a Planet.")

15. Thus the story told by the unstratified rocks is less clear, less certain than that of the stratified rocks, but at the same time infinitely more grand. The latter does not take us beyond our earth; it keeps us among processes and amid scenes with which we are familiar, which exist somewhere now, although perhaps on a smaller scale than before; hence its teachings are certainties. But the former, from its very nature, must be uncertain; though for a time it confines us to the earth, yet it is amid conditions that are no longer present, and that we can hardly realize. It does more; it takes us away from the earth, carries us to the heavens, and makes us look upon our world as only one of the innumerable stars, like them in its present or past condition, with a like future history, and with them forming a part of one universal plan designed by the Almighty Architect.

* See Lockyer's *Elementary Lessons in Astronomy*.

LAND SURFACE OF THE EARTH.

1. The diversity existing in the appearance of the land surface of the earth, in hill and mountain, valley and plain, the very oldest strata coming out into view in some places, although elsewhere buried far below the others, has its cause in operations of nature visible all around us.

Upheaval of Strata by contraction of the Earth.—If a desk, inlaid with leather, be made of wood not well seasoned, the leather will rise in little folds or wrinkles as the wood becomes drier and consequently smaller; so also as apples dry, the skin, which is fastened to the flesh, shrivels; and ice rises in ridges upon a decreasing body of water beneath.

The various strata of the earth, now so often seen bent and crumpled in every form, were originally laid down flat or nearly so. When they were laid down the earth was warmer than at present, and consequently



FIG. 7.—CURVED STRATA OF JURA MOUNTAINS SHewing denudation of some FOLDS.

larger. As the cooling process went on the solid outer strata had to accommodate themselves to a smaller supporting surface; this of necessity was accompanied by a displacement of a portion of the strata, which took the form of great wrinkles, or folds.

Such is essentially the opinion of geologists, deduced from a great variety of facts; and such the method of reasoning pursued. They also think that the changes took place, on the whole, very gradually, as they are known to be doing now.

CAUSES MODIFYING THE FORM OF LAND.

2. As soon as strata are above water they come under the influence of destructive agents that tend greatly to modify the forms presented by mere upheaval: though the operations of these agents in most cases are slow, yet, being continuous, in the course of time they produce prodigious changes. "The whole surface of the land is being torn down, and is moving seaward."

Modifying Agents.*—Rain.—The brooks, formed by rain, that run down and furrow hill-sides, and finally collect into larger streams, are more or less charged with

mud. This mud can come only from the wearing away of the rocks; the process may be slow, but it is sure.

Rivers.—No better illustration of the effect of rivers can be given than that of the Niagara river, which has cut its way through solid rock for seven or more miles. The Grand Cañon of the Colorado has been worn to a depth of from 3,000 to 6,000 feet. (See Fig. 16.)

Frost.—Rock absorbs water, and when in winter the water expands in freezing, it shivers the rock. Frost is one of the most effective of modifying agents.

Heat.—Heat, from its chemical nature and its power of causing everything to expand, is a powerful agent of disintegration.

Ice.—In mountains, the glaciers, where they exist, are scooping out deep valleys; for as they pass onward they tear up, grind and score the rocks beneath them, wear down or round off projecting parts, and carry to the valley below loads of rubbish that has fallen upon them from



FIG. 8.—PASSAGE WORN BY WAVES THROUGH HAREST ROCKS (North of Scotland).

the mountains; while from beneath the end of each issues a stream thick with mud, or *detritus*, that will be deposited again somewhere in the valleys below.

Among the White Mountains the lower peaks are smoothed and rounded to the very top, while the loftier ones show the same action of glaciers to the height of over 5,000 feet; the same appearances are seen among the Thousand Islands, and in other places where the Laurentian rocks are at the surface.

* See further under "Waters of the Land"; "The Ocean"; "The Atmosphere."

Waves.—The shores of the Canadian lakes fully display the power of waves in removing matter; where soft, the banks often lose several feet annually, and where hard, the process though slower is as sure; no rock, however firm, can successfully resist wave-action. The shores of the Bay of Fundy are of the hardest basaltic trap, yet the beach is strewn with huge fragments, with sand and gravel, while under them is the smooth, polished floor of worn-down rock.

Waves wear away, or *erode*, the rocky shore in several ways: by chemical action on the rock; by dashing against it and tearing off fragments; by hurling these fragments against it, and by the incessant rolling and tossing about of the beach stones. These all tend ultimately to wear down to a level the parts affected by wave-motion. Any difference in hardness in the rock, a crack, a vein, or a depression, will give rise to an indefinite variety of shore-outline.



FIG. 9.—ISLAND DESTROYED BY WAVES (North of Scotland)

Still other agents, but with effects opposite in character to the preceding, are at work, changing the form of land.

Volcanic Action.—In addition to the upheaval of land by the contraction of the earth, volcanic action going on in very many parts of the world, throws up lava, and builds up mountain cones, and even mountains, sometimes within a few hours.

Monte Nuovo near Naples, a mountain 440 feet high and a mile and a-half in circumference at the base, was thrown up in one night in the year 1538; and in 1759 Mount Jorullo, in Mexico, was thrown up to the height of 1,600 feet in the course of the year. In 1780 Skaptár Jökul, in Iceland, threw out lava that covered to a depth varying from 100 to 600 feet a tract of country 100 miles in length, and from 12 to 15 in breadth.

Sediment.—Further change of contour is produced by the accumulation into deltas, of the sediment brought down by rivers. The Mississippi annually brings down

and pours into the Gulf of Mexico a mass of sediment equal to a solid 268 feet high and a mile square. Its delta is known to have advanced in places 262 feet in a year. The Ganges, the Po, the Nile, and other large rivers whose mouths are but little exposed to tides, are also forming large deltas.

The same process is going on in lakes into which rivers empty. The rapid current of the river prevents sediment from falling to the bottom; but when the quiet water of a lake is reached the sediment falls and gradually fills up the lake. The Rhone starts from the foot of a glacier, and enters as a muddy stream into Lake Geneva; it issues from the lake blue and clear, but at the upper end Port Valais, a little lakeside town in the days of Julius Caesar, is now two miles from the lake, the *alluvium*, or land formed of sediment, filling up all the distance between.

These phenomena are visible wherever running water enters still water.

Springs.—Though more limited in their action, springs do their work of change, especially in limestone regions. The baths of San Filippo, in Italy, have built up a hill a mile and a quarter long, nearly half a mile broad, and fully 250 feet high.

Winds.—While winds help in tearing down some hills, they build others up. Long ridges of hills are met with on the shores of our lakes, composed of sand blown up from the beach; this is especially seen in Prince Edward county. Holland and Denmark and the south-east of England are lined with such hills and ridges; in England they have covered villages and destroyed great stretches of farming land.

Thus, while the eroding agents, rain, frost, etc., are tearing down the land, producing changes of one character, the contraction of the earth and other causes are producing other changes and tending to keep constant the amount of land already above water. Whether this amount is really constant, has not yet been ascertained.

Thus, too, throughout land and sea and air, there is continual activity, continual change: Nature has nothing dead or inert.

FORMS OF THE LAND SURFACE.

3. **Distribution of Land.**—The dry land occupies about one-fourth, or 52,000,000 square miles, of the earth's surface. An inspection of the map will show that by far the greater part of this land surface lies in the northern half of the earth; if a circle, having its centre in England, were to be drawn round the earth and enclosing half of its surface, almost all the land would be contained within that circle. This fact has, among other things, an important bearing on climate. (See "The Atmosphere," secs. 23-30.)

4. **Continents; Structural Plan.**—The continents, or great *stretches* of land, seem to have a definite plan of construction; each is evidently dependent upon its mountain system. Without mountains there would be no continents.

In America, close to the western side, a chain of mountains, the Andes and Rocky mountains, extends in a general north-westerly direction from near the Ant-

The plan of Europe and Asia, the two continents being regarded as one, is different in some respects from that of America, but similar on the whole. The great mountain chain, or *primary axis of the continent*, as it is often called, runs in a general easterly direction from Portugal to China, passing through the Pyrenees, the mountains of France, the Alps, the Balkans, the Taurus, the mountains of Kurdistan, the Himalayas, and the

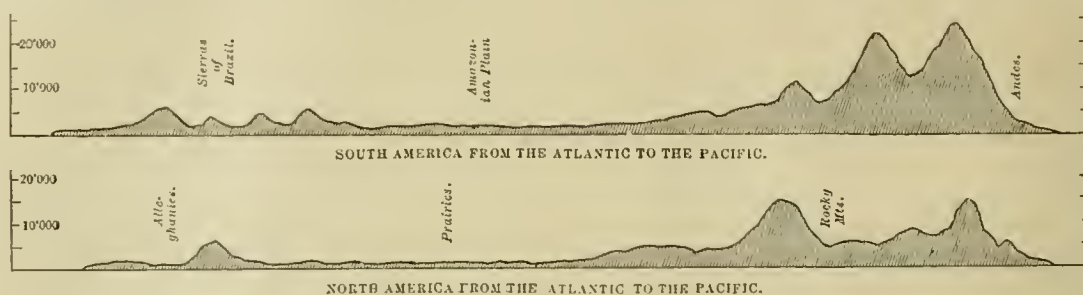


FIG. 10.—PROFILE OF STRUCTURE OF NORTH AND SOUTH AMERICA. [This arrangement of the plans of the continental profiles is for the sake of comparison: it does not indicate that the highest land is on the east side of each continent.]

arctic Ocean to the Arctic; on the eastern side of South America, but at some distance from the coast, several smaller parallel chains, the Brazilian Andes, extend in a general north-easterly direction, and thus give to the continent a divergence towards the north. In North America a similar state of things exists: the Appalachian chain of lower mountains, at some distance from

Kuen-Lun and other ranges of China, to the coast of the Pacific.

To the north of this main axis lie several supporting, or secondary ranges—the Vosges, Black Forest, mountains of Bohemia, and the Carpathians; and in Asia, beyond the plateau of Asia Minor, Armenia, Kurdistan, etc., the Elburz, Thian Shan, and Altai.

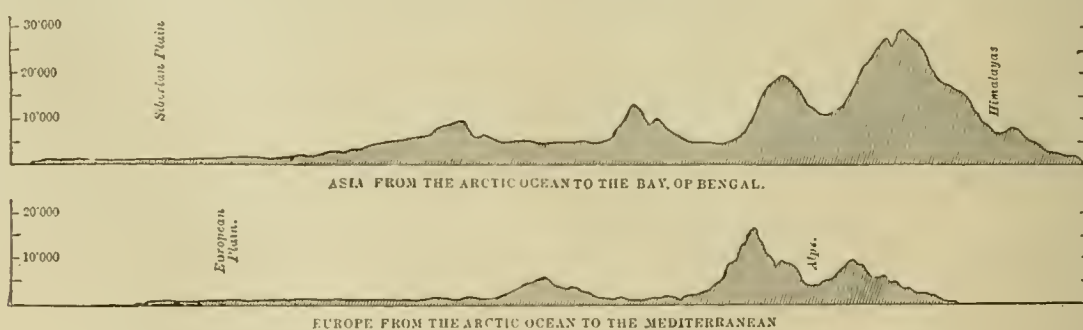


FIG. 11.—PROFILE OF STRUCTURE OF EUROPE AND ASIA.

the coast, extends from Georgia in a north-easterly direction to Labrador, producing a wider divergence than do the mountains of South America. Between these great ranges in each continent lies a plain, a great depression of the land held up, as it were, from sinking by the mountains, and extending, in North America, from the Gulf of Mexico to the Arctic Ocean, and in South America, from the Caribbean Sea to Patagonia.

Africa resembles America more than it does Europe and Asia; but its chief elevation is on the eastern side, and the secondary on the western. No great height, however, is attained, except in Abyssinia. The centre of the continent seems to be a great depression shut in on all sides, from which the rivers escape to the ocean often through deep gorges and over great precipices.

Australia presents features similar to those of Africa, excepting that, like America, it is not enclosed at the south.

In all the continents the slope of the main axis to the nearest sea is abrupt; while the opposite slope and those from the secondary axis are gradual. In all the continents, too, there are cross ranges or elevations, forming, so to speak, the *girders* of the continents. In North America, to the north of the boundary between the United States and Canada, the "Height of Land," an elevation hardly ever exceeding a thousand feet above the sea, runs from the Rocky Mountains to Labrador. In South America a similar elevation lies along the parallel of 15° south, while the Acaray and Parimé mountains cross at the north. Europe and Asia have many cross ranges, which, to the south, stretch far out into the sea, thus giving the extremely irregular coast line to those con-

3. Both continents spread widely towards the north, and there end in broad flat plains, while they contract greatly towards the south, ending in rocky promontories.

4. They are broadest along the same parallel, viz., 50° north.

5. The peninsulas of each, with few exceptions, project towards the south.

6. The opposite coasts of both correspond to each other very closely—the eastern projection of South America would fit into the Gulf of Guinea; the western projection of Africa would fill up the Caribbean Sea and the Gulf of Mexico.

7. The terminal peninsulas of each have corresponding islands, or chains of islands, accompanying them; Florida, Greece, Farther India, have chains of islands; South America, Africa, India, Australia, have islands.

8. The coasts of the northern continents are deeply indented by arms of the sea; those of the southern continents are almost unbroken. Too much importance in the history of civilization cannot be attached to this fact.

When such a great degree of similarity, if not of identity, exists in the structure of the great land surfaces of the earth, a similarity that extends even to details, it is impossible not to be convinced that the causes that produced the whole were the same. If we know the direction and character of the mountain ranges, we know the form of the country; if we know the form of the country we know the mountain ranges. This lie of the land has important bearings on climate, productions, etc. (See "The Atmosphere," secs. 29, 30.)

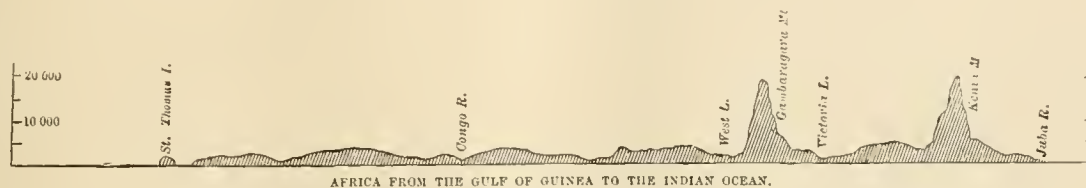


FIG. 12.—PROFILE OF STRUCTURE OF AFRICA.

tinents on the south. Africa has cross ranges at the north, through the middle, and at the south.

Though resembling each other in very many respects, each continent has its own peculiarity. Europe has been called the "continent of mountains"; America, the "continent of plains"; Africa, the "continent of plateaus"; Asia, the continent combining all these features, and on the grandest scale.

Further, it may be noticed that where a mountain chain, or a series of rocky highlands ends, the sea comes in; only such can oppose a barrier to the destructive action of water. The result of the absence, or partial absence, of the secondary axis of the American continent, between latitude 10° and 30° north, is seen in the huge gap of the Gulf of Mexico and Caribbean Sea, made by the Atlantic current, and checked only by the mountains, or hills, of the isthmus.

Further resemblances and contrasts in the continents:

1. The New World is longest from north to south; the Old, from west to east.

2. Both continents have their greatest extension, north and south, along the same meridians.

5. Importance of Mountains.—Upon mountains and lower elevations the existence of continents depends; with their own rise they carry up great tracts of land also; they preserve the land from destruction by the sea; they largely control the size and direction of rivers by determining the slope of the land.

The character of a coast line depends also upon mountains or highlands. Where mountains skirt the sea, few or no inlets exist; the coast is *unbroken*, except where a gap admits the sea, or where a river, flowing in a low valley between parallel ranges, has worn its way through and let the salt water in to form a harbor, as in the case of the Sacramento river. (See North America, "Coast Waters.")

Australia, Africa, South America, and the west of North America, have almost unbroken coast lines. But where the mountains are back from the sea, as in eastern North America, or send off spurs, or short ranges, that end in the sea, harbors, bays, etc., are numerous; the coast is *broken*, and the extent of coast line vastly increased. Europe and Asia, the former especially, show

this feature in a marked degree. Intercourse between different countries, and hence commerce, is greatly facilitated by these indentations of the land. Their influence on climate is most important, and, consequently, on plant life and animal life, including the character and pursuits of man.

Mountains, from whatever cause, are the source of most of the minerals so necessary for civilized man. In the political world mountains form natural boundaries between nations.

6. Characteristics of Mountains.—Mountains—elevations of two thousand feet and upwards—appear as *isolated peaks*, always of a volcanic character; as *chains*,

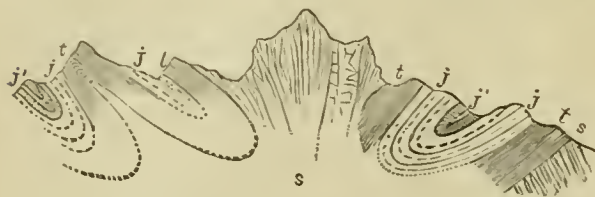


FIG. 13.—FAN-SHAPED STRUCTURE OF THE ALPS; showing the strata contorted and denuded, exposing the central metamorphic rock (s); the same lettering indicates the same strata.

a succession of peaks usually united for the greater part of their height; and as *systems*, two or more chains running parallel and united in the same way as the peaks of a single chain are united.

7. Appearances of Mountains.—The appearances presented by mountains are due partly to the character of the rock composing them, and partly to the manner in which they were formed.

Trap rock, though often seen as single peaks, usually extends in long comparatively unbroken ridges, one side being quite steep and the other shelving off in a number of terraces, the ridge often terminating in a bold bluff such as Thunder Cape on Lake Superior, and Cape Blomidon at the eastern end of the trappean range that skirts the south shore of the Bay of Fundy. The long exposure to denuding agents has given to these ranges their rounded, generally uniform character.

Other mountains are but the most elevated portions of the great folds in the earth's crust caused by contraction and settling. If the ridges are of moderate height, the rocks appear in quite regular folds (see fig. 7), presenting a uniform appearance to the eye, with but little of the magnificent scenery.

But in the great mountain systems, which are usually flanked by lower mountains of the folded structure type,

the most magnificent scenery is found; the centre rises high in the air in huge masses and "shoulders" of granite, or shoots up in splintered, ragged crests of hard, crystalline, metamorphic gneiss or slates. (Fig. 13.)

The peculiar appearance of these summits is due to the destructive agents of nature. At the base and far up these mountains, and even to the summits, the sedimentary strata are everywhere seen, but twisted, contorted, and overthrown in every imaginable form; the ends of the strata show that a vast amount of material has been removed by denudation, and that the granitic masses and the splintered crags of metamorphic rock were by this means brought to the surface, where their harder texture has kept them from wasting as rapidly as the others. It is estimated that from the top of the Uinta Mountains, in Wyoming, strata to the extent of three miles in perpendicular height have been removed by denudation.

8. Dependence of Soil upon Strata.—The character of the soil depends upon the character of the strata beneath, or, if alluvium, of the strata from which it is derived; the chemical constituents of the rock remain after the rock is decayed. Plants derive certain necessary elements of their growth from the soil; if these elements are absent, or present in insufficient quantity, a poor or stunted growth is the result. If the chemical constituents of a plant are known, an analysis of the soil will determine whether the soil is suited to the plant.

VOLCANOES.*

9. As formerly explained, volcanoes burst up from beneath through the stratified rocks. The matter that they throw out, gradually accumulates into a mountain; hence the cone shape of most volcanoes. At the top of

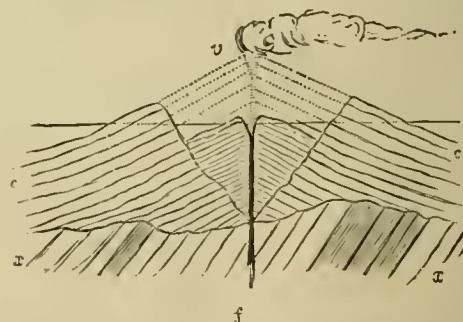


FIG. 14.—STRUCTURAL PLAN OF A VOLCANO. x, the underlying tilted strata through which the molten matter has burst; f, the funnel of the volcano; c, volcanic matter ejected and forming the cone; r, the crater which has been blown out and is filling up again till it may reach the cone-shape indicated by the dotted lines.

the cone is a cup-like basin called the *crater*, its edges being composed of cliffs of lava or other ejections; within this is the orifice communicating with the interior of the earth. "A large area that has been flooded with

*The chief volcanoes will be described under the countries in which they occur.

lava is perhaps the most hideous and appalling scene of desolation anywhere to be found on the surface of the globe."

10. Volcanic Phenomena.—Volcanoes throw out melted rock, or lava, ashes, sand and dust, gases and steam, and often torrents of mud.

The eruptions are accompanied by fearful noises within the earth, and the heaving and rocking of the ground. Sometimes the whole top of the mountain is blown off by the explosions, or one side of the crater is torn away; in each case a new cone is soon built up around the vent.

Some volcanoes discharge only lava, such as Mauna Loa in the Sandwich Islands; others, such as Cotopaxi and other South American volcanoes, discharge no lava.

The *amount of matter* discharged is sometimes enormous. (See "Volcanic Action," sec. 2.) In 1823,

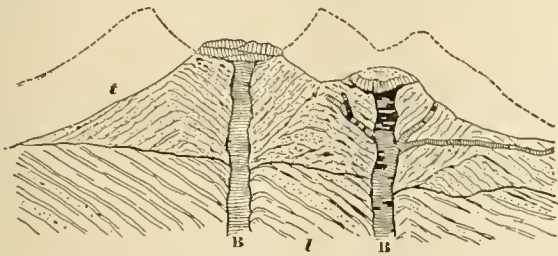


FIG. 15.—OLD (PALÆOZOIC) VOLCANO; structure revealed by denudation; B, funnels filled with basalt; t, volcanic matter; l, stratified rock; the dotted lines indicate the probable original form before denudation.

Kilauea, in the Sandwich Islands, discharged, it is said, over 27,000,000,000 cubic feet of matter; ashes and mud from Vesuvius, in A.D. 79, overwhelmed the surrounding country, including Pompeii, Herculaneum, and other towns. Equally destructive have been volcanoes in Java and elsewhere.

The *force of the explosions* is often prodigious. In 1883 the mountain of Korakoa, in the Straits of Sunda, was completely blown away, together with the island on which it was situated. Cotopaxi, in South America, is known to have hurled a distance of nine miles, a mass of rock weighing over 200 tons. Vast masses of dust have been forced as high as 10,000 feet into the air, and have then been carried great distances. During an eruption, in 1815, of Tomboro, in the island of Sumbawa, dust was carried over 800 miles, and houses forty miles distant were crushed in by the weight of matter falling on them. The dust covered an area of 1,000,000 square miles, and amounted to fifty cubic miles of material. In 1783, dust from Skaptar Jökul fell in such quantities on the north of Scotland, 600 miles distant, that it covered the ground and destroyed the crops.

Very few volcanoes are in constant activity; Stromboli, in the Lipari Islands, has always been active within historical times; others are more or less intermittent; still others are extinct or nearly so. France contains a large number of extinct volcanoes.

11. Arrangement of Volcanoes.—Beginning with Tierra del Fuego (itself the "land of fire"), a continuous line of volcanoes extends along the western coast of America, through the Aleutian Islands, and down the eastern coast of Asia and its islands, through the East India Islands, and New Zealand, to Mount Erebus in South Victoria Land, thus surrounding the whole of the Pacific.

Beginning again with Central America, another chain extends round the earth by way of the West Indies, the Canaries, the islands of the Mediterranean, the Red Sea and Indian Ocean, through the East India Islands, and the islands of the Pacific,—the worst volcanoes being where the two circles cross. This arrangement is the *linear* arrangement. Another, consisting of groups, such as is seen in Iceland, is termed the *central* arrangement. There are said to be somewhat over 400 volcanoes on the earth.

12. Causes of Volcanoes.—Several theories have been put forth as to the origin of volcanoes. According to one theory, the molten mass of the interior of the earth is forced up through rents and openings in the earth by means of the expansive force of gases, and of the steam formed from water that has percolated through the rock down to the heated mass. Another theory supposes that the percolating water meets with chemical substances deep down in the earth, and combines with them producing such great heat that the rock is melted and forced upward by steam. A third theory—one growing in favor—attributes volcanoes to the same cause that produces mountains, viz., the contraction of the earth. In settling down upon the contracting mass below, the earth's crust exerts a pressure sideways, or *laterally*, inconceivably great; pressure always produces heat. Hence the heat developed by the lateral pressure of the earth's crust must be enormous. Bodies under pressure remain solid even though heated far beyond the usual melting point; but if the pressure be relieved instant melting takes place. The pressure of the earth's crust is relieved along mountain ranges where the crust gives way, and hence the rocks melt and are forced upward by the pressure and by the expansive power of the steam that is generated at the same time.

VALLEYS.

13. Valleys among mountains owe their origin to the folding or breaking of the earth's crust during the

upheaval of the mountains. But their size and depth have been everywhere increased by the erosive action of running water, and in many cases, of glaciers also. In plains of any kind the valleys have been produced by running water, facilitated at times by breaks or contortions in the strata. The erosions are often very deep. In the plateau of the Rocky Mountains, the Grand Cañon (*can'-yun*) of the Colorado river reaches 6,000 feet in depth.

desert of Gobi, Persia, Arabia, and the Sahara ; also the great depression in the Rocky Mountain plateau. These all contain salt lakes with no outlet, and often have large districts covered with saline matter.

The character of the surface corresponds to the condition of the underlying strata. If the strata have not been materially displaced during upheaval the plateau will be level ; if the strata have been contorted the surface will be broken accordingly, unless where, by long

exposure to eroding influences, they have been worn down to a level.

"Most of the great table-lands of the globe seem to be platforms of little-disturbed strata, either sedimentary or volcanic, which have been upraised bodily to a considerable elevation. These may be termed *Table-lands of Deposit*. But whatsoever its mode of origin, the plateau undergoes a gradual transformation under continued denudation. No sooner are the rocks raised above the sea than they are attacked by running water, and begin to be hollowed out into systems of valleys. As the valleys sink, the platforms between them



FIG. 16.—CANON OF THE COLORADO.

PLAINS.

14. Plateaus.—A plain elevated over 1,000 feet usually receives the name of *plateau*. Some plateaus are bordered with steep slopes, as is the case with Spain ; others gradually sink, as does the great plateau east of the Rocky Mountains ; some are flanked with chains of mountains, as is the great plateau of Asia ; others are huge platforms from which rise chains of mountains,—such is the Rocky Mountain plateau.

Many of the larger plateaus are covered with sand, pebbles, or rock, and are in a great measure barren and without rain. Such is the great region including the

grow into narrower and more definite ridges, until eventually the table-land is converted into a complicated network of hills and valleys." (Geikie's Geology.)

The importance of plateaus consists in their forming the original part of continents, in giving these shape and direction, and also in being, to a great degree, the gathering ground for the rivers of the world.

The highest plateau is that of Thibet in Asia, varying from 10,000 to 18,000 feet in height.

15. Plains proper.—These are extensive tracts of land, usually level, but often diversified with hill and valley, rising nowhere much above 1,000 feet in height.

They border the continents and stretch up rivers far into the interior. "The largest plain in the world is that which, beginning in the centre of the British Islands, stretches across Europe and Asia." Its southern limit is formed by the highlands of central and southern Europe, and the plateaus of Asia Minor and the south of Siberia; to the north it gradually slopes away till it disappears under the Arctic Ocean, while to the south of the dividing Urals it falls off till, beneath the Caspian, it is 3,000 feet below sea level. "For several hundred miles southward from the Arctic Ocean traces of recent sea-shells are found in the superficial deposits. Similar evidence likewise exists around the Caspian and Black Seas. There is thus proof that large portions of the great plain of the Old World comparatively recently formed part of the sea-floor."

Another immense plain stretches from the Gulf of Mexico to the Arctic Ocean; and in South America from the Caribbean Sea to Patagonia, a distance of 3,500 miles. Along the eastern part of North America, between the mountains and the sea, lies a sandy and not very fertile plain of varying breadth and nowhere higher than 100 feet above the sea.

"They (plains in general) are the tracts that have received the detritus washed down from the slopes above them, whether that detritus has originally accumulated on the land or beneath the sea. Their surface presents everywhere loose, sandy, gravelly, or clayey formations, indicative of its comparatively recent subjection to the operation of running water."

Where rivers overflow their banks and spread out into wide sheets, the sediment contained in the water is deposited, and the plain assumes a peculiar character; it is wholly level, no inequality appearing anywhere. Such plains are called *alluvial plains*, and their fertility is practically inexhaustible. The plains of the Amazon, Orinoco, and La Plata; the "bottom lands" and delta of the Mississippi, the plains and delta of the Ganges, of the Euphrates, the Nile, the Po, and numerous other rivers, are all alluvial.

The alluvial plains in the Old World have, from the earliest historical times, been the home of a dense population and the seat of great kingdoms.

Some plains, like the vast prairies of North America, are treeless, and, where rains are periodic, become during the dry season, parched wastes such as are seen along the Orinoco, and elsewhere in South America.

Alluvial plains are often very slightly elevated. A thousand miles from its mouth the Mississippi is only about 400 feet above sea level; while the Amazon is only 250 feet high at the same distance from its mouth. Hence the current is very sluggish, and any unusual increase of water will, of necessity, cause the river to overflow.

ISLANDS.

16. Islands occur in two positions: one, near continents; the other, far remote in the ocean.

Continental Islands.—Those near continents are of the same material as the continents themselves and have the same characteristic productions of both plants and animals. They run often in chains parallel to the continent, with water of no great depth between, or they form prolongations of the continent itself. Like peninsulas in general, they owe their existence to a range of mountains running through them. Some of these islands are of great size. From their position and characteristics they evidently are part of the continent itself, and are usually called *continental islands*.

17. **Oceanic Islands.**—The other islands have peculiarities all their own. They are remote in the ocean, hence the name *oceanic*; they are usually small, and generally, though not always, occur in groups, and they are composed either of volcanic matter or of coral-formed limestone. The former are of the usual volcanic conical shape, sometimes reaching the height of 14,000 feet, as in the Sandwich Islands, and may be active volcanoes or not. It is not probable that these ocean-mountains are higher than the land-mountains, since the latest explorations give to the ocean an average depth of about 2,500 fathoms.

The coral islands are composed of limestone, the material for which is extracted from the water by great colonies of a marine animal of the lowest order, termed a polyp. These animals cannot live in water of a temperature under 68° Fahrenheit, nor can they live in muddy water, nor at a depth greater than 120 feet, nor above water. Hence coral islands are found only in warm climates, and only where the water is clear, never near the mouth of large rivers.

The work of the coral polyp assumes several forms: *coral fringes*, or belts of coral that line the shores; *coral reefs*, lying at some distance from the shore and encircling an island; *barrier reefs*, great walls of coral rock running parallel to large islands or continents, such as the Great Barrier Reef to the north-east of Australia, over 1,250 miles long, and from ten to ninety miles broad; and lastly, *atolls*, or circular coral islands consisting of a ring of land enclosing a sheet of water, which is the usual form of coral islands.

18. **Origin of Deep Coral Reefs.**—Coral reefs extend sometimes to the depth of 2,000 feet. The explanation accepted is the following: The coral polyp begins to build in the shoal water near land or upon a submarine

plateau within 120 feet of the surface of the water. It builds only upward, a living polyp building upon the work of a dead one; as it builds, the foundation ground slowly subsides, the building up keeping pace with the subsidence. Thus reefs of any depth may be formed.

Atolls are formed in the same way. At first they are a fringing reef round some volcanic island; the island slowly subsides; a ring of water will thus form between the conical-shaped island and the reef; at last the island sinks out of sight altogether, leaving a circular reef enclosing a sheet of water—termed a *lagoon*—within it. The reef, on account of having broken fragments of coral and other material thrown upon it by the waves, gradually rises above water; the loose material, under the



FIG. 17.—AN ATOLL.

action of the sun, wind, and rains, soon forms soil; seeds are brought to it by the waves and by other means, and an island is the result.

Coral fringing reefs occur in the West India Islands, and along the coast of Florida; reefs of both kinds, in the East India Islands, but atolls are found only in the Pacific.

“The facts connected with atolls and deep reefs prove that the bed of the Pacific has lately been sinking, and may be sinking still.”

WATERS OF THE LAND.

Rivers.

19. **Origin of Rivers.**—The water found on the land surface of the earth is due directly or indirectly to rain

or snow. Whatever of these is not absorbed by the ground, taken up by vegetable growth, or removed by evaporation, is seen to pass off in the form of streams. Water everywhere naturally tends to a lower level, hence all the surplus of a tract of country that has in any part of it one lowest level, will tend toward that level. Collecting first at the bottom of the smallest depressions, the water passes downward into larger depressions which have received water from others also. By thus passing onward from one single depression to others that belong each in succession to an ever-increasing area of country, the united streamlets grow gradually larger till at last the lowest level of the tract is reached. Such a tract of country is termed a *basin*, the extreme limit of which is called a *watershed* or *divide*. If the basin is wholly enclosed, that is, if from every point there is a dip of the land inward, the united streams will form a mass of water, termed a *lake*; such are the Caspian Sea, Salt Lake, Lake Superior, etc. If, however, in addition to a lowest depression within itself, the whole basin has a general dip towards a still deeper depression, the united streams will flow onward till this latter is reached. Such a union of streams into one is termed a *river*; the depression along which it flows is termed a *river valley*, and the space between the banks occupied by the water, a *channel*.

The various streams that unite to form the river are termed *affluents* or *tributaries*;* they are often of such a size as to be large rivers themselves. Thus the Missouri, an affluent of the Mississippi, is one of the great rivers of the world; some of the affluents of the Amazon are over a thousand miles long.

20. **Size of Rivers.**—The size of a river as to volume depends upon the area of the basin, the amount of the rainfall, and the extent of the evaporation; the length of the river depends upon the length of the lowest depression traversing the basin.

Where length and area of basin, and amount of rainfall are greatest, and evaporation is least, there will be found the largest rivers. These conditions meet in the Amazon. The rainfall is excessive, the area of the basin (2,300,000 square miles) is the greatest in the world, the central depression is the longest, and evaporation is greatly impeded by the dense forest growth throughout the larger part of the basin. The Mississippi, with half the area, discharges only a fourth as much water; but a great part of its basin is treeless, and therefore the evap-

* Often also *branches*—a misleading term—for it is not descriptive of the true relationship of the stream. The sub-divisions of a river in a delta might properly be termed *branches*.

oration is excessive; it also lies outside the region of constant rain.

21 Sources of Rivers.—A large portion of the surplus water of a river basin does not immediately pass off in the form of streams; if it did, disastrous floods would follow each rain-storm, and only dry river-beds would at other times exist. But large tracts of low-lying land, and innumerable small ones, are filled with a soft, spongy soil that takes up water very freely, and allows it to drain off again very gradually in the form of brooks; such tracts are called *swamps*; also, much of the rain that falls enters into the soil and eventually reappears as springs. (See “Springs,” sec. 34.) Again, in Switzerland and elsewhere, some of the surplus water takes the form of a glacier, the gradual melting of which gives rise to the stream, or torrent, that is seen to issue from its termination; and the innumerable lakes, large and small, that lie scattered throughout every river basin, serve the same purpose, viz., as reservoirs from which the water slowly passes off without producing harm. (See “Lakes,” sec. 33.) If one of these reservoirs lies at the upper extremity of the main depression of a basin, the river is said to *rise*, or have its *source* in it. Such, however, is the case with but few rivers, since the depression seldom starts with the crest of the watershed.

22. Current of Rivers.—The rapidity of the current of a river depends upon the character of the channel and the volume of water in the river. If a channel is free from obstructions, and steep, the current will be swift; if the channel, though steep, is obstructed by rocks or by curves the current will be slower. In the upper part of the channel the descent is usually steep and rocky; hence, waterfalls and rapids are often found; farther down it is usually less steep, and the current is consequently slower, while the lower part of the basin is often nearly level. The force already acquired, and the pressure of water behind, keep the river in progress where the fall of the ground is too slight to do so. “The Amazon for the last 700 miles of its course falls but one-fourth of an inch in every mile and a-quarter; and the Ganges has scarcely any perceptible fall for the last 1,300 miles of its course.”

23. Windings of Rivers.—The course of a stream is along the lowest depression of a basin, and will be straight or crooked accordingly; the character of the depression in this respect being due to the original elevation of the land,

or to some other peculiarity in the underlying strata. But where the river passes through a plain having but a slight dip, and where, in consequence, mechanical action is least, the windings are caused by very slight circumstances—a difference in hardness of the banks, a difference in height, or an obstruction of any kind.

“Some slight weakness in one of its banks enables the current to cut away a portion of the bank at that point. By degrees a concavity is formed, whence the water is deflected to the opposite side, there to break with increased force against the bank. Gradually a similar concavity is cut out on that side, and so, bending alternately from one side to the other, the stream is led to describe a most sinuous course across the plain.” The course by this means is greatly lengthened and the current retarded, so that it “may become a lazy, creeping stream.” In the windings of a river the sides of a loop, or bend, often approach so near one another that only a narrow neck of land separates them; this neck is often cut through gradually, or broken by a rush of water during a flood. The river will occupy the new channel, and the loop, sometimes miles in extent, will be abandoned to form a lake, or to be gradually filled up.

24. Erosion of Rivers.—In the upper part of their courses, especially if the ground is steep and rocky, streams are often found to pass through gorges that have evidently been worn out by the action of the water itself. Absolutely pure water would produce little effect upon compact rock; but, in addition to matter held in solution, ordinary running water is found to contain particles of solid matter, and also to some extent acids which are derived from decaying vegetable matter.

Erosion of rock is produced, therefore, by two means: first, and chief, by the mechanical action of the solid matter, more especially by that of the gravel, stones, and pebbles that are forced by the stream along the bottom; and secondly, by the chemical action of the acids. Erosion is always greatest where the water runs most swiftly; for there both mechanical and chemical action will be greatest. The action will be, in a great measure, confined to the bottom of the stream; hence the gorges of the upper course of streams. (See cut of “Cañon of the Colorado,” Fig. 16.)

But when the stream enters a plain where the current is slower, a great deal of the sediment falls to the bottom, thus protecting it from further erosion; hence the action of the water will take place at the sides, and the stream will “broaden out.”

25. Waterfalls and Rapids.—An abrupt lowering of the valley of a river—caused by the original upheaval of strata, or by subsequent erosions—produces a *waterfall*; if the lowering is not abrupt, but yet quite steep, a *cascade* is formed, while a more gradual descent with a current too rapid and broken to be stemmed by boats,

receives the name of *rapid*. The tendency of waterfalls is to pass into cascades, and ultimately into rapids.

26. **Deposition of Sediment by Rivers.**—Frequently in the valleys of rivers broad depressions occur causing expansions of water often of the size of lakes; in these the current is slow, and in consequence, sediment will fall and finally fill up the whole depression, excepting the channel of the stream.

Also, when a sudden increase of water in the channel of a river takes place, if the channel is too small to contain it, or the current too sluggish to carry it off with sufficient rapidity, the river will overflow its banks and spread out over the adjacent land. On the disappearance of the water, sediment will be found covering the overflowed district. This process ultimately produces alluvial plains of great fertility. (See “Sediment,” page 7.)

When a river reaches its mouth—the place where it discharges its water—the current is arrested by the quieter water of the sea, and sediment falls,—all the more rapidly as the water of the sea is salt. A great mass of land is thus built up, that finally, after rising to the surface of the water, is elevated still higher by successive overflows, till at last dry and habitable land is the result.

The rapidity with which such a *delta* advances depends upon the amount of sediment brought down by the river, and upon the degree to which the delta is exposed to tide action and marine currents. Where the tide or currents are strong the sediment will be swept away and no delta can be formed. But even here bars and shoals are formed in sheltered spots. (See “Mississippi,” “Ganges,” “Nile,” under the countries to which these rivers respectively belong.)

Where currents drift along a coast, the sediment of rivers is often carried away and gradually deposited in eddies or quieter waters near the coast, forming successions of long and low alluvial islands, such as are seen along the eastern shore of the United States.

27. In whatever way sediment is disposed of, it gradually builds up elsewhere new strata that may some day rise up from the sea, and that will contain the remains of plants and animals now living, just as the strata now forming land show to us by their fossils what was the character of the life on land and in the sea in earlier ages.

28. **Rapidity of Denudation.**—“The whole of the land is slowly making its way seaward.”

It has been calculated that the water brought down by the Mississippi removes one foot of land from over the whole surface of its basin in 6,000 years; the upper Ganges, the same amount in 823 years; the Rhone, in 1,528 years; the Po, in 729 years.

The estimated mean height of North America is 748 feet; hence the whole basin of the Mississippi would be worn down to sea-level in about four and a-half million years, while the basin of the Po would disappear in 7,290 years.

These calculations are merely approximations; no account being taken of upheaval in the meantime.

29. **Utility of Rivers to Man.**—Rivers carry off from the land the surplus water that would otherwise stagnate or collect in fever-breeding marshes; in some cases, in warm countries, agriculture depends upon the annual overflow of rivers, as is the case with the Nile and many East Indian rivers.

Rivers also afford easy means of communication, and consequently of carrying on commerce, with inland countries.

LAKES.

30. Lakes occupy depressions in the land, to which there is usually a drainage from all sides. (See “Rivers,” sec. 19.) If the inflow is greater than the evaporation the excess will pass off as a stream, or in the case of large lakes, as a river. In this respect lakes belong to the river system of countries.

Origin.—Lakes originate in different ways. The innumerable lakes scattered over northern Europe and America are thought to be due to excavation by glaciers, or to the great masses of rubbish borne down from higher ground by glaciers and deposited on lower ground, blocking up one end of a natural depression. (See sec. 10.)

Where lakes occur on plateaus, or heights of land, as do the great American and African lakes, the depressions in which they lie are due to unequal elevation of the strata. In this case, the lakes are often of great extent but of comparatively small depth. Among mountains, lakes lie in chasms produced during elevation; these lakes are sometimes of very great depth; Lake Maggiore, in northern Italy, is 2,800 feet deep and only three miles wide, while Lake Superior, which has an area of 32,000 square miles, is not half the depth of Maggiore. The scenery on mountain lakes is, of course, much grander than that on other lakes.

31. Lakes with no Outlet.—These lakes, almost always salt, are scattered abundantly over the interior of continents, on the Rocky Mountain plateau (the Great American Basin), and on the great plateau of Central Asia.

In nearly all the districts around these lakes there is abundant evidence of former outlets. On the hills around the Great Salt Lake of Utah, even at an elevation of 940 feet above the present level of the lake, are to be seen *lake terraces*, viz., what were once beaches and shallows of a sheet of water. The lake must have reached this high point, and there it had an outlet to the Pacific. It was fresh also, for in the stratified deposits of the terraces and elsewhere, the remains of fresh-water shell-fish are abundant.

Many evidences in connection with these lakes point to a change in climate by which the amount of rainfall was greatly lessened; the climate thus became drier, the evaporation increased to such an extent that the inflow did not counterbalance it. The water then shrank slowly to its present level. The chemical elements held in solution in the incoming water, and gathered by it from the ground over which it had passed, either remained charging the water of the lake, or sank to the bottom after combining into various compounds, such as salt, gypsum, magnesia, saltpetre, borax, and alkalies. These substances, especially salt, are often found in such quantities on the shores during the driest part of the season (when the water recedes to some extent), as to give rise to extensive industries.

Other salt lakes are evidently remnants of a time when the ocean covered the surrounding regions. Such are the Caspian Sea, Sea of Aral, and Dead Sea. These retain their original saltiness, for the most part greatly intensified. In the Caspian lives a variety of the common northern seal; and one of the greatest seal fisheries in the world is in the same sea. The shell fish of the Caspian are mainly those of the Black Sea, and the remains of these are abundant between the two seas, as are also salt lakes and pools, and marshes. The steppes of Southern Russia, with salt lakes and deposits of saline or alkaline matter, were evidently once a sea also. (See under "Asia.")

32. Destruction of Lakes.—Lakes may be destroyed in two ways. Each stream, large or small, that enters a lake is laden with sediment, and as the still water of the lake will not hold the sediment, the latter falls to the bottom. Thus, a fan-shaped layer, ever increasing in size, is formed at the mouth of the stream, which, in time, will fill up the lake and leave an alluvial plain traversed by a stream.

Where a lake is situated on high ground the stream issuing from it will, in time, wear its way backward to the lake and drain it. Evidences of this are of common

occurrence along rivers, where at different heights above the river gorges broad expanses of alluvial soil show that lakes once existed. A similar fate seems in store for Lake Erie, for the Niagara Falls are slowly but surely working their way towards it. (See sec. 25.)

33. Economy of Lakes.—When situated along a river basin they collect any extraordinary inflow of water and allow it to pass off again regularly, and thus prevent floods.

When of considerable size, they temper the climate to some extent, at least in their immediate neighborhood. "Lakes serve as basins in which chemical deposits may take place. Of these the most interesting and extensive are deposits of iron ore, which chiefly occur in northern latitudes."

For the geologist lakes are of deep interest, because they "receive the remains of the plants and animals washed down from the surrounding country, and entomb these organisms in the growing deposits, so as to preserve a record of the terrestrial life of the period during which they continue."

SPRINGS.

34. Origin.—A part of the rain that falls upon the ground soaks in, and in its passage downward strikes rock or clay that it cannot readily penetrate; as strata are seldom horizontal, the water will follow along the top of this rock, and at some point below where it entered,

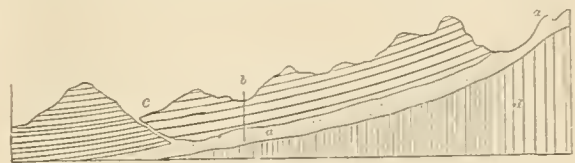


FIG. 15.—SPRING AND ARTESIAN WELL. *a*, a porous stratum exposed to rain at one end; *c*, a joint in impervious stratum, forming spring; *b*, artesian well, with top lower than exposed part of *a*.

will reappear at the surface as a spring. This is a simple surface spring. If the strata are highly inclined the water will make its way to the surface through cracks in the rock. Springs of this character are often large.

Should there be a stratum of impervious rock or clay over the porous stratum, the water will not reach the surface. If, in this case, a hole be bored through the upper stratum the water will rise in the hole, and, in many cases, flow out at the top in considerable volume, forming an "Artesian well." The point at which water enters strata may be at an indefinite distance

In addition to the mere percolation of water through the strata, there are also underground streams and reser-



FIG. 19.—GEYSERS, ICELAND.

voirs, especially in limestone. Sticks, leaves, and living fishes have been thrown up by Artesian wells.

Some springs flow steadily throughout the year, a fact which shows that their water comes from a source not affected by rainfall; others diminish or disappear during dry weather; the origin of the latter is near the surface. Springs will be more numerous where there are mountains; for there rainfall is greatest, and the fissured and distorted rocks allow the water to enter freely, and supply underground channels for its flow and reappearance.

35. Temperature of Springs—Hot Springs.—Surface springs will be of about the same temperature as the surrounding atmosphere; deep-seated springs will be colder. Hot, or *thermal*, springs are very numerous, and are found chiefly in regions of existing or extinct volcanic action; they are of all degrees of heat up to the boiling point. The *Geysers* of Iceland, which send up boiling water to the height of over a hundred feet, have long been known. Others, on a still larger scale, have been recently found near the head-waters of the Yellowstone. New Zealand also contains very many hot springs.

36. Mineral Springs.—Springs are often highly charged with mineral matter. The sulphur springs of Ontario, at St. Catharines, Preston, and other places, are well known. The waters of some mineral springs yield large quantities of salt on evaporation; others are charged with compounds of iron; still others, with compounds of lime—these latter encrusting all near-lying objects with a calcareous matter. Besides these there are gas springs, that emit inflammable gas; oil springs, that afford petroleum; bituminous springs, that yield a kind of tar, or pitch, and others.

THE OCEAN.

1. The Ocean occupies about three-fourths of the earth's surface, or an area of 145,000,000 square miles, and has its greatest development in the southern hemisphere.

The position and form of the ocean depend upon those of the land: the same force that produced the upheaval of the mountain ridges and the consequent elevation of the included portion of the earth's crust, produced also the depressions in which, as the lowest part of the earth, the waters gathered together. And as the various strata of the land show no evidence of having been deposited in deep sea, but on the contrary, show abundant evidence of deposition in the neighborhood of land, geologists are of the opinion that the main bed of the existing ocean has always been the bed, though the

ocean has often covered land from which it is now excluded. They are also of the opinion that the ocean is growing deeper in its main depression, for the contraction of the earth is still in progress, and the upheaval and depression take place along the old lines.

The *saltiness* of the ocean is in part, at least, original, the result of the union of the chemical elements *chlorine* and *sodium*. These elements still exist in different rocks, soils, etc., and are carried by rivers into the sea. Some scientific men hold that the ocean water is slowly becoming saltier through evaporation, and that it is also diminishing through absorption by the ground.

2. The Different Oceans.—The great mass of water on the earth lies in the south, as the great mass of land lies in the north. From this mass of water branches extend northward between the great bodies of land.

The *Atlantic Ocean* extends between Africa and Europe on the east and the Americas on the west, expanding at the north into the *Arctic Ocean*. The length of the Atlantic, reckoning from one end of America to the other, is about 9000 miles; its breadth varies from 900 between Norway and Greenland to over 4000 between Morocco and Florida. The general form of the ocean is that of a huge channel with its opposite shores parallel, and running first north-westerly and then north-easterly.

The *Pacific Ocean* is the largest of the oceans, containing twice the area of the Atlantic. It extends between Asia on the west and the Americas on the east; after reaching the equator it rapidly narrows till at the north it shrinks to a passage thirty-six miles wide, by which it

name often being borne by bodies of water of quite different character.

The term *sea* is given to the Mediterranean, Black, and Baltic, and also to the Arabian Sea, the three first being land-locked, the last being open. The name *gulf*—properly a deep bend in the coast—is borne by such bodies of water as the Persian Gulf, and the Gulf of Mexico, and of California—all different in character. Hudson Bay and Bay of Bengal are also different in form, a *bay* being properly more land-locked than a gulf. A *bight* is a long, sweeping, but not deep, indentation of a coast, as the Australian Bight. A *sound* is a long, somewhat broad, but shallow body of water, running generally between an island and the mainland, as *Long Island Sound*. A *strait* is a narrow passage between two bodies of water. Where there are numerous islands over a wide area of water the name *archipelago* is given.

The Atlantic has many more of these offshoots than any other ocean; those of the Pacific are for the most part shut off from the main ocean by islands. The Indian

Ocean has numerous and important offshoots, but few due to islands.

The Pacific is preëminently the ocean of islands; few are found in the others, except the West India group in the western Atlantic.

4. Character of Surface of Sea-floor.—Within the last few years the Atlantic has been largely explored, and the ocean is shown to exceed the depth of 3,000 fathoms in only a few places; in most places the depth varies from 2,000 to 3,000 fathoms; off the

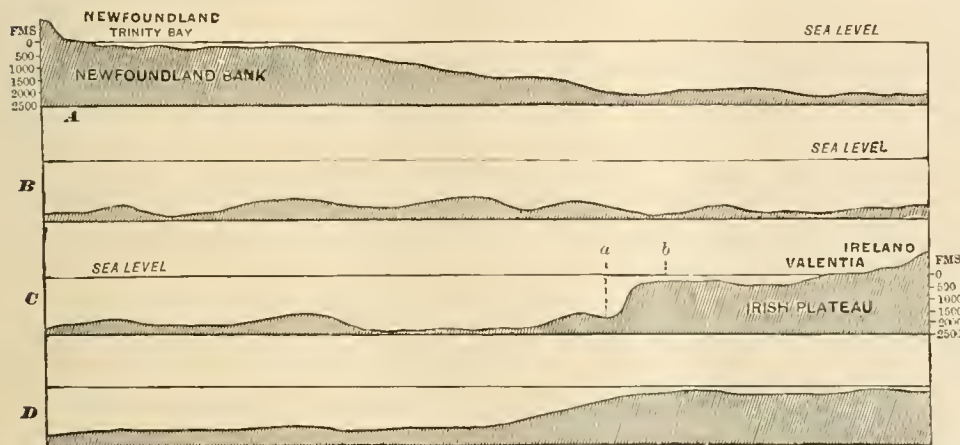


FIG. 20.—A, B, C, showing continuous profile of bottom of the ocean traversed by submarine telegraph between Trinity Bay, Newfoundland, and Valentia, Ireland. Perpendicular scale much greater than the horizontal. D is the section between *a* and *b* of C, drawn to a true scale, showing the real character of the slope from the Irish plateau.

communicates with the Arctic Ocean. Its breadth along the equator, from Peru to Sumatra, is over 12,000 miles, while its length north and south is about 9,000.

The *Indian Ocean* is but a swell of the great southern ocean, enclosed at the sides by Africa and by Australia with the islands north of it, and terminated by the highlands of Asia. Its breadth and length are each about 6,000 miles. *Antarctic Ocean* is the name given to that part of the southern ocean within the Antarctic circle.

The southern limits of the three oceans, Pacific, Atlantic, and Indian, and the northern limit of the Antarctic, as assigned by geographers, are purely arbitrary. The important fact to be remembered is the one stated at the beginning of this section.

3. Offshoots of the Oceans.—The offshoots of the ocean, or rather those parts of the ocean that are more or less enclosed by land, go by various names, the same

island of St. Thomas, in the West Indies, the depth of 3,875 fathoms was obtained. The northern part of the Pacific is of about the same depth as the Atlantic, but off the coast of Japan the depth of 4,475 fathoms was reached. The soundings thus obtained, together with the existence of islands such as the Azores, Cape Verd Islands, St. Helena, and others in the Atlantic, and the great chain extending across the Pacific from near Chili to the coast of Asia, show that there are submarine plateaus and ridges, and that, upon the whole, the ocean floor corresponds in form to the surface of the exposed land.

The effects of the ocean upon the land are confined to the part of the shore affected by the waves and to those shallow parts of the ocean where strong currents exist. The dashing of the waves on the beach, with the accompanying roll of the loose stones and sand, in a comparatively short time wear down the rock to a flat surface; while

the currents of the more open sea, though as certain in their action, are slower in their effects, owing to the absence of the stones and sand of the beach.

In the depths of the sea beyond the action of waves, the sluggish currents have little or no eroding effect. Soundings have brought up mud, or *ooze*, of the ocean floor, and its fine character and delicacy of material show that if the water of the abysses moves, it is but slowly.

5. **Material of Sea-floor.**—Recent explorations have shown that the sea-floor for a distance of two hundred or three hundred miles from the shore, consists of the sediment, or *detritus*, washed down from the land, the coarser part being nearest the shore or in the track of sea-currents, the fine sand and clay being farthest away or accumulated in depressions. These latter contain abundant remains of sea animals and land plants. Beyond this band, and ranging to a depth of nearly 2,900 fathoms, the floor of the Atlantic and Pacific is “almost uniformly covered with a widespread deposit of fine creamy or grayish mud, generally called *ooze*,” which when dried closely resembles chalk. The greater part of this *ooze* consists of chalky, or calcareous, skeletons (or shells) of a microscopic animal of the lowest order, living at the surface of the ocean.

The greatest, or *abysmal*, depths of the ocean, however, are covered with fine red clay, the product, it is thought, of volcanoes, for everywhere no matter how far away from volcanoes, volcanic matter sometimes in large blocks, has been dredged up from the bottom. Some of this material, called pumice-stone, may have been emitted by submarine volcanoes.

6. **Depth of Water near Shore.**—The character of the shore indicates the depth of the water near it. If the shore is bold and rocky the water is deep, for either the cliffs descend below the water, or the slope from their base is steep; while a low, shelving shore has the same character when prolonged under water.

7. **Temperature of the Ocean.**—“In tropical regions the sea is of necessity warmer than elsewhere. As the distance from the tropics increases the temperature of the water decreases.” Though this is true in general, there are many modifying circumstances.

Land-locked seas, such as the Mediterranean, are found to possess a higher temperature than the ocean in the same latitudes; the temperature in parts of the Indian Ocean is as high as 94°. The surface water of the North Atlantic is colder than that of the North Pacific; in the latter the temperature is about 70°, in the former between 44° and 54°. The reason for this is found in the fact

that the cold polar water is almost shut out of the North Pacific, while it has a wide entrance into the Atlantic, as it has also into the South Atlantic and Pacific. The temperature of polar waters is about 32°.

But the warm temperature is confined to surface water. In the North Atlantic, after a depth of from 750 to 1,000 fathoms, the temperature decreases, till at about 3,000 fathoms it is only three degrees above freezing point. In the South Atlantic the warm layer is only 300 fathoms thick, after which a temperature of about 33° is soon reached. In the North Pacific the bottom temperature is about the same as that of the Atlantic, but in the South Pacific it sinks to 31°, while the warm layer is only 100 fathoms thick. In the tropical regions it is a remarkable fact that the warm surface layer, having a temperature of 76° or 80°, is only about 300 fathoms thick, followed very closely by a temperature of only 40°, and in very deep water 32°.

At great depths the water does not freeze even though it may be below the temperature of 32°, because salt water does not freeze so readily as fresh water, and because the pressure of the overlying water is so great—32° being the freezing point of distilled water at the surface of the sea.

MOVEMENTS OF THE OCEAN.

Waves.

8. The particles of water, on account of their very slight degree of cohesion, move very readily among themselves; hence one body of water may readily pass over or through another without materially disturbing it. Such streams, or *currents*, exist in untold numbers in the sea; the vast majority of these are merely local, but others affect the whole extent of the ocean.

The force with which wind strikes the surface of water gives rise to inequalities, termed *waves*, varying from ripples to great hills of water. Earthquakes and tides also produce waves.

9. **Size and Rapidity.**—Waves are not so high as they often seem; the greatest observed height in the open Atlantic, where they are the largest, has been forty-three feet.

Except as a part of the general current produced by winds, the water of a wave does not move forward; an object floating on the water rises and falls with the waves, but in other respects is stationary. *Motion*, or force, is communicated to the water, and shows itself in the effect produced on the water by raising it in heaps while passing onward. In shallow water, however, waves have an onward motion as a body.

The height and rapidity of waves depend upon the force of the wind and the breadth and depth of the water over which they move. The deeper the water and the greater its breadth, the greater the height and the force of the waves.

"It has been calculated that a wave 100 feet in breadth, and in water 100 feet deep, travels at the rate of fifteen miles an hour; one 1,000 feet broad, and in water 1,000 feet deep, at the rate of forty-eight miles; whereas another 10,000 feet broad, and in water 10,000 feet deep, will sweep onward with a velocity of not less than 154 miles per hour."

10. Force of Waves.—On nearing shore the lowest part of the wave strikes the ground, and is retarded in its motion, while the top, continuing forward, curls over and breaks in foam.

The force with which these breakers dash upon the shore is often very great. Where a shore is exposed to the full sweep of the wind, the gales of winter send waves upon it that strike with a force of three tons, or more, to the square foot. In the Shetland Islands "blocks of rock, up to nine and a half tons in weight, had been washed together at a height of nearly sixty feet above the sea," and "blocks weighing from six to thirteen and a half tons had been actually quarried out of the original bed at a height of from seventy to seventy-five feet."

"At Plymouth, also, blocks of several tons in weight have been known to be washed about the breakwater like pebbles." "In Shetland, also, breakers have been known to dash 196 feet high, with sufficient force to overthrow a wall and break in doors." At Dunnet Head, on the Pentland Frith, the windows of a lighthouse, over 300 feet above sea-level, have been broken by pebbles hurled up by the breakers, and the lighthouse itself has been flooded with water.

The disturbance in the water created by wind is felt far away from the region of the disturbance. This is manifested by the heaving of the water in long undulations called *ground swell*. It is this ground swell, especially after it has passed over deep areas of the sea, that produces the grandest breakers.

11. Earthquake Waves.—The waves produced near the shore by earthquakes are of a most destructive character; they roll in upon the shore in enormous volume and with fearful rapidity and force. In 1883, during the earthquake that accompanied the destruction of Mount Korakoa in Java (See "Land Surface of the Earth," sec. 10), it was mainly the enormous waves that caused the terrible destruction of life and property. In 1854, the town of Simoda, in Japan, was destroyed by successive waves that rolled on shore during an earthquake; in twelve hours and twenty-eight minutes afterwards these earthquake-waves were felt at San Francisco, a distance of 4,527 miles.

TIDES.

(N.B.—For explanation of references to form and motions of the earth, and to the sun and moon, see "The Earth as a Planet.")

12. Causes of Tides.—It is a law of the universe that every particle of matter attracts every other particle of matter however distant, and "with a force inversely as the square of the distance." It is this attraction that gives *weight* to bodies.

Both the sun and the moon exert an attractive force upon the earth; that of the moon is greater than that of the sun since the moon is nearer the earth. The particles of water, owing to their slight degree of cohesion, display the influence of the attraction by rising up towards the attracting body in a vast wave, or bulge. As the earth moves rapidly on its axis from west to east, each portion of the surface is successively presented to the attracting body. Thus the *tidal-wave* travels round the earth.

Were the earth one sheet of water, the tide wave—which is similar in character to ordinary waves—would pass round the earth with perfect regularity; but its path is interrupted by the continents and islands, consequently its course is devious in the extreme. In the southern ocean the wave advances westward quite regularly; in the Atlantic it advances north in a curve that crosses the ocean; in the Pacific and Indian oceans it advances both west and north.

When the crest of the wave reaches a place, it is said to be *high-water*, or *high-tide*; and two or more places that the tidal wave reaches simultaneously, have high water at the same time, no matter how far apart, or in what direction from each other, they may be.

But the endless variety of sea coast produces an endless variation in the time of high-water. Thus, when it is high-water at the head of the Bay of Fundy, a few miles away in various parts of Minas Basin (an offshoot of the bay) it is not high-water till an hour later.

13. Number of Tides Daily—Causes.—About six hours and thirteen minutes elapse from the time when the outmost rim of the tidal wave reaches a place till the crest of the wave arrives: in other words, the tide is six hours and thirteen minutes in rising. After the crest passes, the water slowly falls for the same period of time as it occupied in rising; then a pause of a few minutes takes place, after which the water is again seen to advance, and in six hours more it will again be high-tide although no attracting body is visible; another slow retreat follows after a similar length of time.

Thus, in twenty-four hours and fifty-two minutes there are two high-tides and two low-tides. The usual explanation of this phenomenon is as follows:—

The attracting body—moon or sun—attracts the whole mass of the earth, land as well as water. The ground is rigid—if one part moves by attraction the whole moves at the same instant. Water is not rigid, its particles move freely among themselves, and one part may be affected without materially affecting another part. When the attracting body raises up the mobile water in a heap beneath it, the whole mass of the ground starts forward as well, but not to the same extent; the water still remains heaped up, but not as high as it otherwise would be. As the solid ground starts forward in obedience to attraction, the mass of water on the opposite side of the earth will not instantly follow, but lag somewhat behind and will have the appearance of advancing on the land,—the shore is in reality being pulled away from it.

14. Spring and Neap Tides.—The tides produced by the sun alone are less than half the height of those produced by the moon alone, though the influence of neither planet is at any time absent from that of the other. If the attraction of the moon and that of the sun were exerted in the same line the effect upon the water would be greater than that produced by one alone.



FIG. 21.—SPRING TIDES; the attraction of the sun and moon exerted in the same line. In both figures the water is represented by the shaded portions.

This state of things happens twice a month—at new and at full moon. In the first case the attraction of both is exerted on the same mass of water beneath, and on the same part of the solid earth; consequently the water beneath will be raised higher, and the earth drawn more powerfully from the water on the opposite side, and so on each side the tides will be higher. At the full moon the moon and sun are on opposite sides of the earth, nearly; each attracts the water, and each produces a tidal wave, the moon's being the higher. But as the moon attracts the solid earth more powerfully than does the sun, the distance that the earth in consequence advances toward the moon counterbalances the greater height of the moon's tide. Thus these *spring tides* are equally high on opposite sides of the earth.

When the sun and moon exert their influence at right angles, they tend to draw the water one from the other: hence the tides will be low. These are termed *neap tides*. The higher the water rises the farther will it run off when it falls.

15. Height of Tides.—The height to which tides rise depends upon the character of the coast, the kind of basin they enter, and the degree to which the coast is exposed to the direct advance of the tidal wave.

In the Pacific, where the water is deep, very little change in height is noticed, sometimes scarcely over a foot; but where the tidal wave enters a wide-mouthed basin with converging and perpendicular sides, such as the Bay of Fundy, the water, unable to spread out as the wave advances, must rise in perpendicular height. At the head of one branch of the Bay of Fundy the height of seventy feet has been reached.

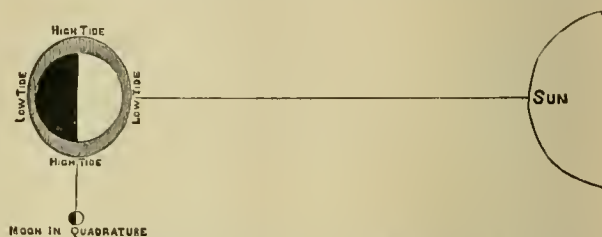


FIG. 22.—NEAP TIDES; attraction of moon and sun at right angles; the moon tide being higher than the sun tide.

16. Phenomena of Tides.—In the exposed and converging mouths of rivers the tidal wave often enters like a bank, or wall, of water and with furious speed, sometimes causing great destruction. This *bore*, as it is termed, is seen in the rivers of China, in the Hoogly, the Garonne, Severn, Amazon, and many others. In one of the Chinese rivers the bore is thirty feet high.

In channels that expose a wide mouth to the wave, but that have a narrow egress, the current produced is often very rapid; in Pentland Frith the current runs from ten to twelve miles an hour. Among islands two opposing tidal waves often meet and, especially in stormy weather, result in a whirlpool.

On very shelving shores, such as are found in Cumberland and Shepody Bays, offshoots of the Bay of Fundy, the tide falls off for miles, leaving vast flats exposed. Over these flats, too, the advancing tide takes the form of the bore.

Lakes, even large ones, have scarcely any perceptible tide due to solar or lunar influence, the whole surface of such bodies of water being equally attracted at nearly the same moment.

CURRENTS OF THE OCEAN.

17. For obvious reasons very little is known about the currents of the sea below the surface currents; but the

soundings made with the thermometer have shown a sudden fall of temperature after a certain depth was reached; also the soundings have revealed the existence of masses of water (between Scotland and the Faroe Islands, for example) lying side by side having very different temperatures. In each of these cases only currents moving from arctic regions could produce the phenomena observed. Surface currents, as the Gulf Stream, are known to have temperatures widely different from the surrounding water; hence it is inferred that under-currents have the same peculiarity.

There are very many circumstances that modify, or wholly change, the direction of currents,—barriers of any kind, a projecting point of land, a concave shore, a ledge of rock, ridges far below the surface or rising as islands in the sea, winds, unequal temperature and consequently unequal evaporation, conflicting currents, inequalities of bed, accumulations of sediment, etc.

18. Causes of Ocean Currents.—The first great cause of ocean currents is *the inequality with which the surface of the ocean is heated*. If one side of a vessel containing water be heated the water will flow off from that side and its place be taken by the water lying next it. Thus a current is formed. The great heat of the tropical regions raises the temperature of the ocean within their bounds, and the water will consequently flow off toward the north and south. This in part gives rise to the *drift currents*.

A second cause exists in the *trade winds*. (See "The Atmosphere," sec. 13.) Winds, besides raising the water into waves, drive it forward often with destructive effect, inundating low-lying districts such as exist along the North Sea. Where the winds are constant the current of water so produced will be constant also. The north-east trade winds north of the equator produce a current from the north-east, while the south-east trade winds south of the equator give rise to a current from the south-east; the united winds blowing westward carry the water with them.

A third cause is the *excessive evaporation in the tropical regions*; the water thus removed is replaced by the colder water from beyond the tropics, for water naturally flows toward a spot in which the ordinary level has been reduced below that of the surrounding water.

19. Chief Warm Currents.—The *Equatorial Current*. Starting off the west coast of Africa, especially where the trade winds begin to be felt, this current, produced by the union of the current from the north-east and that from the south-east, flows westerly across the Atlantic to South America, where it is obstructed; resuming again to the west of South America it flows across the Pacific

to China and the East India Islands, with a breadth of about 3,000 miles, and with a velocity of from two to three miles an hour. When, in the Atlantic, this current reaches South America it divides on the projecting corner of that continent; one part, called the *Brazilian Current*, flows southward along the coast, and afterwards turning to the south-east, under the name of the *Connecting Current*, joins a current from the pole and returns to the equatorial current, thus describing a circle. The northern portion of the current flows along the north of South America; on striking the West India Islands a part of it is checked and turned from its course, while the other part passes onward, enters the shallow and confined basin of the Gulf of Mexico, sweeps around it, passes out between Cuba and Florida, then turning northward flows between the Bahamas and Florida, and enters the Atlantic with a velocity of from three to five miles an hour, and is known as the *Gulf Stream*.

The *Gulf Stream*, whose waters are of a dark blue color readily distinguishable from the green water around it, has a temperature as it issues from the Straits of Florida of about 80°; its breadth is about thirty-two miles and its depth about 2,000 feet; flowing along the coast of the United States it rapidly broadens and loses depth. When off New York it turns more to the north-east, leaving the American coast; one part of it now continues north-east with water from 10° to 15° warmer than the ocean, and joining the general northern surface drift from the tropics spreads out over all the eastern part of the North Atlantic, bathing the shores of Britain and Norway; the other part turns eastward, crosses the Atlantic and finally joins the north-east current to be again swept westward. (See "The Atmosphere," sec. 27.)

In the western side of the Pacific Ocean the southern part of the Equatorial Current is, in part, turned from its course by the islands; some of it runs down the coast of Australia to join the cold current from the south, while the greater part of the rest forcing its way through the islands into the Indian Ocean, strikes the coast of Africa, and, passing south-east along Madagascar and through Mozambique channel, bends eastward on reaching the Cape of Good Hope, and after a time is finally lost in the drift current from the Antarctic Ocean. The northern part of the equatorial current, on reaching the Philippine Islands, bends sharply north, then turning north-east, under the name of the *Japan Current*, or *Kuro Sivo*, it sweeps in a broad, dark blue current past Japan

and across the North Pacific, where it again bends southward, till off the coast of Mexico it enters the general westward flow once more. This current is not so warm as the Gulf Stream, for it does not originate in such shallow water as the latter, nor in a land-locked basin. As the surface of the North Pacific is much warmer than that of the Atlantic (See "The Ocean," sec. 7), the effects of this current are not so marked as those of the Gulf Stream.

20. **Periodical and Local Currents.**—Where winds change according to the season the currents will change also, as in the northern Indian Ocean.

The excess of evaporation in the Mediterranean over the inflow from rivers causes a strong current to set in from the Atlantic through the Straits of Gibraltar. Similar to this in cause are the currents entering from the Caspian into its land-locked offshoots.

21. **Cold Currents.**—The great western sweep of the currents carries the water away from the western shores of Africa and South America; the surface of the sea is thus lowered in those regions, and, in consequence, water from the Antarctic will flow in to supply the place. Hence there is a general set of the *Antarctic water* north-

ward, giving rise to cold currents along the west of Africa and South America and for a similar reason along the west of Australia.

Again, the Gulf Stream, with the warm surface drift, flows along the eastern side of the North Atlantic, thus tending to lower the water on the western side; consequently a cold *Polar current* sets down along Greenland, and, meeting with another from Baffin Bay, flows down the eastern coast of North America as the *Labrador Current*, as far, at least, as the Chesapeake Bay.

22. **Phenomena of Currents.**—Floating material of all kinds is apt to collect within a space around which water flows; hence directly to the north of the north equatorial current there is a vast extent of the ocean covered with sea-weed, and known as the *Sargasso Sea*; similar regions are found north of the Sandwich Islands, and in other places. These masses of weed are not torn from rocks, but grow where they are found floating on the water. They are the home of countless myriads of marine animals.

Tropical productions are borne by the currents to regions far distant, and polar sea-animals and plants are met with in the temperate zones.

THE ATMOSPHERE.

1. **Importance of the Air.**—Though all the operations of what is termed "nature" are closely united, yet the phenomena connected with the air are so varied, so all-pervading, that the air has justly been called the one essential feature in connection with our earth; not only do heat and cold, light and darkness, storm and calm, depend upon it, but even life itself, whether in plant or animal, in the deepest sea or on the highest land.

2. **Composition of Air.**—The air is a fluid, and obeys the same laws as other fluids.

Pure air is made up of a mixture of two gases, oxygen and nitrogen, in the proportion by weight of twenty-one parts in a hundred of the former, and seventy-nine of the latter; these proportions are everywhere the same.

But we know that other substances must be in the atmosphere, although they form no part of pure air. When water *evaporates*—that is, turns into vapor—we can often see it pass off into the air; air, therefore, con-

tains *aqueous, or watery, vapor*. When plants or animals are decaying a gas is found to be given off, viz., *carbonic acid gas*; the same gas is present in the breath that comes from the lungs of animals; it is given off in large quantities from active volcanoes, and also from some extinct ones. Next to oxygen and nitrogen, these two substances are the most important in the atmosphere.

Though their quantity is great yet the proportion they bear to the whole body of the air is small; of aqueous vapor there are from four to sixteen parts by weight in a thousand of carbonic acid gas the proportion is much less. The air resting on a surface a mile square is estimated to contain 13,800 tons of carbonic acid gas, or 3,700 tons of pure carbon.

There are other substances in the air in minute quantities, such as *ammonia*; *solid matter* of many kinds, seen in the dust, or motes, in a beam of light; of these, *carbon*, the black part of smoke, is the most important; oxygen, chemically united with carbon, produces carbonic acid gas.

3. **Importance of these Gases.**—The aqueous vapor of the air gives rise to rain, snow, mist, hail, dew, and frost, and is the cause of storms. (See also sec. 8). Oxygen sustains animal life; it enters the lungs, unites

with the surplus carbon of the blood, producing the carbonic acid gas which is given off in the breath. Plants in their leaves change this gas back again to carbon and oxygen, retaining the carbon and setting free the oxygen.

Thus what is thrown off by animals is taken up by plants as necessary for their growth, and what is thrown off by plants is taken up by animals.

4. **Weight of the Air.**—The earth attracts all things to it and thus gives them weight; air, therefore, has weight.

If a bottle have air forced into it by means of an air-pump, and then be closely corked and weighed, it will be found to weigh more than before the air was forced into it.

The force with which the air presses downward upon the earth is ascertained by means of a *barometer*;* this force is nearly fifteen pounds to the square inch at the level of the sea. There the whole mass of the air is overhead—extending to a distance variously estimated at from fifty to two hundred miles.

It is evident that if the weight of the column of air be diminished, the mercury in the barometer will fall accordingly; the mercury in the barometer falls in proportion as we rise above the sea, for then some of the air is below us. By careful attention to this fact the barometer has become of great value in determining the elevation of places above sea-level.

5. **Density of the Air.**—The air is a highly elastic fluid, yielding to pressure and expanding indefinitely when the pressure is taken away. Consequently the air next the earth is denser than that farther removed. At the distance of about three and a half miles above the earth the mercury in the barometer stands only fifteen inches high. This fact shows that half the weight of the air is below that elevation.

Animals do not feel the great weight of the atmosphere pressing upon them, because the cavities of the body are filled with elastic gases that counteract the pressure of the air; these gases, in their efforts to expand, press outward in all directions, with a force equal to the inward pressure of the air. On ascending high mountains, or on going up in balloons, the nose, ears, etc., are apt to bleed, for the outside pressure being somewhat removed, the internal gases expand and burst the more delicate blood-vessels.

6. **Changes in Pressure of the Air.**—The pressure of the air decreases as the height above the sea-level increases; but the pressure at the sea-level is not uniform over the globe, nor is the pressure at the same place always constant. At one time the pressure may be *high*—that is, the mercury may stand somewhat over thirty

inches in the barometer tube; at another it may be *low*—that is, standing somewhat less than thirty inches in height. (See “Storms,” sec. 21.)

The causes producing these changes are not fully known. It is known, however, that *heat affects the air* by causing it to expand; hence, a heated portion, by becoming more bulky than the neighboring air, in part flows off. Thus warm air is lighter than cold air. *Aqueous vapor* is found to be lighter than air, and if a great deal of this should be present the pressure will be low.

As the barometer indicates any change in the pressure of the air, and as aqueous vapor is more or less connected with all storms, the barometer is of great practical value for the sailor, and for the farmer as well.

7. **Heat of the Air.**—It is very evident that we derive our heat from the sun; the small quantity that may find its way outward from the interior of the earth is *inappreciable*. But we know that the heat is almost all confined within a space of a few thousand feet above the earth. Beyond a certain elevation, varying from near or at the sea-level in the polar regions, to over 16,000 feet within the tropics, the temperature is always below the freezing point; at still higher elevations the cold is so intense that nothing can live. Yet the heat from the sun passes through this icy region in order to reach and warm the earth.

8. **How the Earth is Warmed.**—The atmosphere permits the luminous direct heat of the sun to pass through it unobstructed—without warming it. This heat is arrested by the earth, part of it is absorbed and warms the ground, but the greater part is radiated back into the air, not, however, as luminous or light-giving heat, but as dark heat; *this dark heat the aqueous vapor in the air will not allow to pass away readily*: hence it “warms up the air” by warming the aqueous vapor in it; in this manner the heat is retained.

So, when the sun is withdrawn, instead of an icy air instantly coming on and freezing everything, even in a summer's night, a warm covering lies over the whole land. In the higher regions of the atmosphere, at a distance of five or six miles, where the air is thin, there is but little aqueous vapor, and hence there is nothing to prevent the heat from passing off into space unperceived, and in consequence, the cold is intense. So, if aqueous vapor were removed, life would perish from the earth, and all things be scorched by day, frozen by night.

The extent to which the air is heated, or, in other words, the amount of heat there is in the air, is indicated by the *thermometer*.*

At the sea-level, with the ordinary barometric pressure, pure fresh water boils at a temperature of 212°, and freezes at a temperature of 32°. If the normal pressure is changed, a change in the phenomena attending these degrees of heat will take place.

The pressure diminishes as we rise above the sea-level, and it is found that water will boil at a much lower temperature than 212°. Thus, in the Andes, at a height of 13,000 feet, water boils at 190°. Hence the height of a place above the sea-level may be determined by observing the degree of temperature at which water boils. A greater degree of pressure than that exerted by the atmosphere would prevent water boiling at 212°, or freezing at 32°.

* The barometer must here be procured and fully described.

* The construction and action of the thermometer must be fully explained.

As the aqueous vapor arrests radiated heat, the warmest temperature will be found nearest the earth. As a rule, heat decreases as we ascend, but not uniformly; a great many circumstances influence it; it is found, however, that the temperature falls one degree for about every 590 feet of ascent. (See "Climate," sec. 29.)

MOISTURE OF THE AIR.

9. The moisture of the air is directly due to evaporation. Everywhere on the earth, even in polar regions or in sandy deserts, evaporation is taking place, though, other things being equal, where the heat is greatest evaporation is greatest, for warm air can contain more aqueous vapor than cold air. Wind, by carrying off aqueous vapor, and thus constantly bringing other air to take up moisture, greatly aids evaporation. The greatest evaporation takes place in the tropical regions, for there the heat is greatest and water abundant. The dryness of air causes moisture to be rapidly turned to invisible vapor, even in the coldest weather.

Absolutely dry air does not exist in nature, since moisture is all-pervading. When we see steam or smoke from a factory extending far away through the air, it is a sign that the air is heavily laden with moisture.

The magnitude of evaporation may be inferred from the fact that all the rain, snow, rivers, lakes, etc., owe their origin more or less directly to evaporation.

Rooms are made cool in summer by sprinkling water on the floor; and a shower of rain cools the air. In each case evaporation takes place, and the heat that produces it is abstracted from the air or the wet surface. When, on the other hand, the moisture of the air condenses—turns into mist or rain—the heat that is taken up is given out again where the condensation takes place.

10. **Condensation of Vapor.**—Warm air can contain more moisture than cold air. If air is saturated, any lowering of temperature, that is, any withdrawal of heat, is followed by condensation. The moisture that the air cannot hold as invisible vapor appears in different forms.

Dew.—In the summer when the ground, during the night, by giving off heat, cools the air in contact with it below the point at which it cannot contain all its moisture, some of the moisture condenses and forms what is known as *dew*. If the sky is clear dew forms rapidly, for the heat passes away more readily than if the sky is cloudy.

Frost.—If the cooling continues till the point of temperature indicated by 32° on the thermometer is reached, *frost* is formed. Frost consists of minute particles of *ice*, which is water in a crystallized or solid form.

Mist or Fog.—Dew and frost are formed from the moisture of the air in close contact with the surface that gives off its heat. If a mass of warm moist air is cooled

to the dew point by the cool ground, or other means, the moisture that it can no longer contain in an invisible state appears as *mist*, or *fog*.

Clouds.—If the mist, instead of lying along the ground, is high in the air, the term *cloud* is applied to it.

When warm moisture-laden air, borne along by wind, strikes a mountain, the air is forced up where the temperature is lower, it will, therefore, be cooled, and mist or clouds formed. Also, the warm air from near the ground, is constantly rising with its load of moisture; this condenses and takes a visible form when the colder regions above reduce the temperature to the dew point, or where the air, being no longer so dense, cannot contain the same quantity of moisture in an invisible state.

The air is constantly in motion, so that clouds assume every variety of form. When the clouds suddenly appear in a clear sky, we know a lowering of temperature has taken place; if clouds disappear the temperature has risen. In the first case a body of cool air may have suddenly invaded the warm air; in the second, warm air has mingled with the cool.

Rain.—If, after the formation of clouds, the condensation still goes on, the mist-particles unite and, becoming too heavy to be upborne by the air, fall gradually downwards, the drops getting larger as they fall till they become *rain*.

The amount of rain that falls will depend upon the amount of moisture in the air, and the degree to which the air is cooled. Hence, where evaporation is greatest rain will be most copious, as within the tropics; and where it is least, rain will be least, as in the arctic regions. (See "Climate," secs. 29, 30.)

Rain washes from the air some of its gases and solid matter, thus purifying it and adding to the soil what is needful for vegetable growth.

Snow.—When the mist condensed from clouds is cooled down to the freezing point (32°), it takes the form of crystals of ice, which, being blown together, form snow. The ice-crystals, or disks, though of many beautiful patterns, are all six-sided.

In ascending into the air we at last reach a point at which the temperature is never above freezing point. This point is called the *snow-line*. It will vary in height above the ground according to the character of the regions beneath. Over the ocean it is uniform in height from east to west, and slopes off gradually from the tropics to the polar regions, where it reaches the surface of the sea. Land warms the air to a greater distance upward than does the sea: hence the snow-line is higher over land than over sea in the same latitudes, reaching sometimes nearly 20,000 feet above sea level. Over mountains it is also higher than over plains, for mountains force warm air far up into the atmosphere.

Glaciers.—In mountains that extend above the snow-line, snow accumulates in large quantities, and gradually sliding down the slopes becomes greatly compressed in

the narrow valleys below ; this pressure, together with the partial melting of the snow when it gets below the snow-line, turns the snow into more or less solid ice. This ice acts precisely like water ; it flows down the valleys towards the lowlands, turns corners, goes over precipices and reunites ; flows faster in the middle than at the sides, and carries along with it loads of stone and earth in long lines, called *moraines*, that have fallen upon



FIG. 23.—GLACIERS. Showing medial and lateral *moraines* and boulder-capped ice cones.

it from the mountain sides. Glaciers also have affluents, as do rivers, each affluent uniting with the main glaciers as completely as water unites with water.

Sleet and Hail.—The former of these consists of rain and half melted snow ; the latter of ice, the cause producing which is not fully known : from their frequent occurrence during thunder-storms they are thought to owe to electricity their origin and often peculiar shape.

MOVEMENTS OF THE AIR.

Winds.

11. *Causes of Winds.*—When a pail of water is dipped from a pond or cistern, the surrounding water is seen to rush in and fill the hollow made by the removal of the pailful. All fluids, air being one of them, act in the same way. It is the downward pressure of the fluid that forces the part next the vacancy sideways into the vacancy.

If we stand near a large bonfire we feel a wind drawing towards the fire ; and we see sparks, smoke, etc., rising rapidly upward. The fire heats the air, and, thus heated, the air ascends, creating a partial vacancy ; the downward pressure of the surrounding air forces the neighboring air sideways into the vacancy : *motion of the air* is thus caused, *which is wind*.

In other words, the heated and ascending air creates an area of *low pressure*. (See “Changes in Pressure of the Air,” sec. 6.) The surrounding cooler air has a *high pressure*, and air from an area of high pressure flows into an area of low pressure.

In like manner the sun heats up some portions of the earth’s surface more than it does other portions ; vast areas having unequal pressure, are thus formed, and a movement of air from areas of high pressure will take place toward areas of low pressure. *All the various winds owe their origin, directly or indirectly, to inequality in the heating of the surface of the earth.*

12. *Constant Winds.*—In the tropical regions the heat is constant and the evaporation excessive—two conditions that produce a constant area of low pressure ; there will therefore be a constant flow of air from both north and south towards the tropics in order to supply the place of that which has risen on being heated. But the place of the air flowing in from the polar regions must be supplied by other air. The heated air that rises within the tropics flows off as an upper current towards the polar regions ; when beyond the tropics it descends, in part at least, to the surface of the earth, where the most of it keeps on its course, but some, turning round, flows back to the tropics along with the wind from the polar regions.

Thus there are two constant atmospheric currents, the inflowing under current and the outflowing, or return, upper current. Only, however, in the ocean, far away from land, is the former of these fully felt ; the land often completely changes the character and direction of wind.

Upper currents are known to exist for the following reasons: clouds near the earth are often seen floating in one direction, while those far above are going in another direction. In 1783 volcanic dust from Skaptár Jökul, in Iceland, 600 miles distant, fell on northern Scotland, destroying the crops. In 1835 a volcano in Guatemala burst forth and hurled far up into the air vast quantities of dust, which was seen to pass away eastward, although the strong easterly wind was blowing at the surface of the ground. This dust fell on Jamaica, 800 miles distant. A similar phenomenon was witnessed in 1815, during an eruption of a mountain in Sumbawa, near Java.

Men ascending in balloons, or climbing lofty mountains, often find wind above the clouds blowing in a different direction from that below the clouds.

13. Trade Winds.—These are constant winds within the tropics, that, north of the equator, blow from the

14. Causes of Direction of Trade Winds.*—The atmosphere revolves with the earth, and has its currents as the ocean has. If the earth were at rest, or if the rotary motion in the polar regions were as rapid as it is in the tropical regions, a current of air from the former would blow directly to the latter. But as the size of the earth, as well as the rapidity of its rotary motion, constantly increases from the poles, the direction of a current flowing from the poles must be constantly changing. As this current advances it successively reaches portions of the atmosphere in more rapid motion than those it

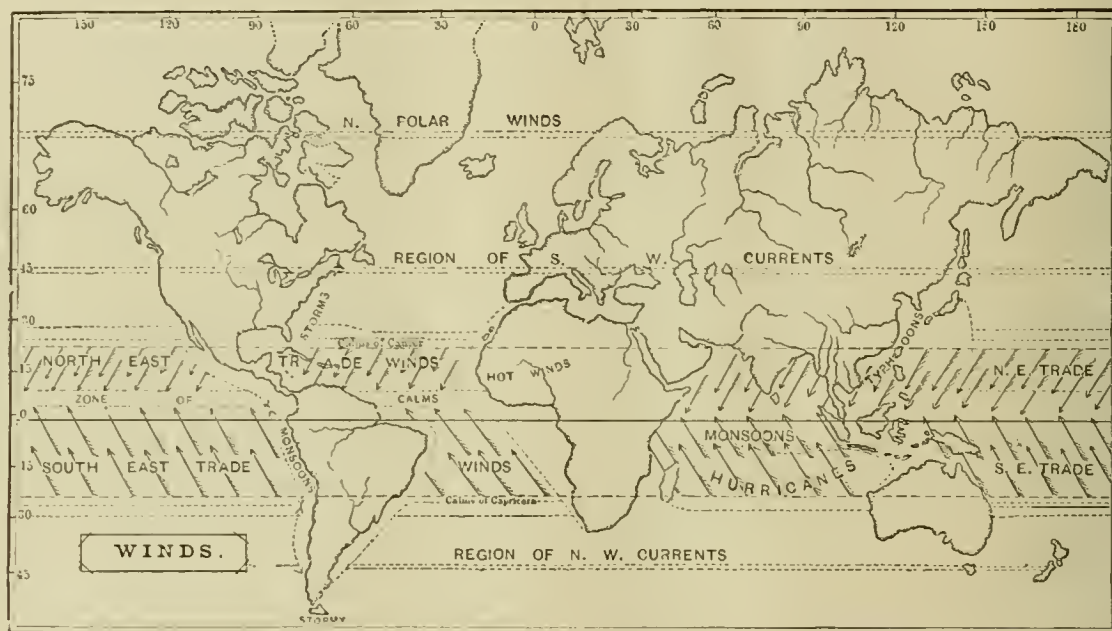


FIG 24.—MAP OF THE WINDS.

north-east toward the equator, and south of the equator, from the south-east. When in the region of the equator they blow westerly; but they are greatly interfered with, or even destroyed, by the land. They are first felt only at a considerable distance west of Africa and of South America; they then blow steadily across the oceans at a rate of from fifteen to eighteen miles an hour; the low-lying basin of the Amazon has but little effect on them, but they are destroyed by the Andes, and by the East India Islands, Australia, and the southern parts of Asia.

During our summer, when the greatest heat is in the region of the northern tropic, the trade-winds are found farther north than during the winter, when the greatest heat is in the region of the southern tropic. There is thus a change in the position of the trade-winds according to the season.

has just left, and not being able to fully acquire the motion of any one portion before it passes onward, it consequently lags behind and seems to move toward the opposite direction, westerly; as the current cannot obey both the southerly and the westerly motion, it moves in a course between them, viz., *south-westerly* if it is a current from north of the equator, and *north-westerly* if from the south of the equator; or, in other words, it becomes a north-east wind in the former case, and a south-east in the latter. On reaching the equatorial "belt of calms" the current turns and flows westward.

* For remarks on "Form and Motions of the Earth," see "The Earth as a Planet."

On the other hand, the upper current of air that flows from the tropics toward the poles, traverses regions of ever-decreasing size and velocity; it will, therefore, outstrip in motion the air through which it passes, and, north of the equator, it will blow toward the north-east, as a south-west wind; south of the equator, toward the south-east, as a north-west wind.

The *Polar Winds* are also constant, since the polar regions form an area of constant high pressure, and hence of constant outflow.

15. *Calms*.—A zone, or belt of calms, varying from 300 to 400 miles in width, runs around the earth; in the oceans this zone lies, roughly speaking, between 3° and 9° north latitude, and on the land, about equally on both sides of the equator; hence it is called the zone of Equatorial Calms. It is the region of the greatest heat and of the greatest evaporation; so great are these that the ascending currents of air, though unfelt, overcome all inflowing wind and a calm is the result. But these regions are subject to sudden and violent storms of wind, as well as of rain, thunder, and lightning. (See "Storms," sec. 21.)

There is another, but not so marked, belt of calms in the neighborhood of the tropics, Cancer and Capricorn, where the upper currents of the air descend and become surface currents. The belts of calms change their position for the same reason as do the trade-winds.

16. *Periodical Winds—Monsoons*.—Monsoons, or *season winds*, occur within and near the tropics, affecting the land and the adjacent water; they really are nothing more than the recurrence, in a more or less modified form, of the trade-winds after an interruption due to extensive tracts of land. These winds belong, in the main, to the northern Indian Ocean and the adjacent land.

In the winter time the lofty plateau beyond the Himalayas becomes very cold, and is, consequently, a vast area of high pressure whence winds blow south, east, and west towards areas of lower pressure and warmer temperature. Thus in the Indian Ocean they blow from the north-east towards Southern Africa; and in the Pacific, from the north-west towards Australia and the islands intervening. In the summer time the same plateau becomes greatly heated, and is, in consequence, turned into an area of low pressure, towards which currents flow from all sides. Thus the south-west monsoons blow from the Indian Ocean inland, and south-east, from the

southern Pacific; and a wind from the west is the prevalent one over Europe.

The change of the monsoons, which occurs about the beginning of April and October, is accompanied by fierce storms that are felt with some severity even in high latitudes.

In the West India Islands and the southern part of the United States, the monsoons also exist; in the summer they blow from the south-west, and in winter, from the north-west. The latter wind is the north-east trade-wind turned from its course by the Rocky Mountains. In the vast plains, farther north, there is the same comparative steadiness of wind.

17. *Land and Sea Breezes*.—Land absorbs and radiates heat much more rapidly than water; hence, especially in warm regions, during the daytime land near the water becomes an area of low pressure, and consequently there will be a flow of air towards it from the sea. But during the night the rapid radiation soon reduces the temperature of the land below that of the sea, and the land becomes an area of high pressure, from which air flows towards the sea.

18. *Local Winds*.—These are due usually to the physical characteristics of a country. The desert regions of Africa, Arabia, and Australia become at times areas of comparatively high pressure, and then hot, suffocating wind, laden with the fine desert dust, blows in intermittent blasts in all directions outward, and over parts of the desert itself. The *Sirocco* (called *Solano* in Spain) comes to the north Mediterranean shores; the *Kamsin*, to Egypt during May and part of April and June; the *Simoom*, in Arabia, Syria, and Africa; the *Harmattan*, on the coast of Guinea during December, January, and February. The *Simoom* raises vast clouds of dust and sand, that have often buried whole caravans and armies.

The low-lying lands in countries having high mountains are subject at certain seasons—usually winter—to cold, dry, and often violent winds falling upon them from the mountains. Such are the *Norther*s, of Texas; *Punús*, of the Peruvian plateau; *Pamperos*, with their clouds of dust, of southern South America; the *Mistral*, of south-east France; the *Bise*, or *Black Wind*, of eastern France; and the *Bora*, of Istria and Dalmatia.

19. *Variable Winds*.—Between the region of the trade-winds and monsoons, and that of the constant polar winds, lies a vast area in which at all seasons, but especially in spring and fall, the winds veer to every point of the compass. But amid the variety, in our northern hemisphere, northerly winds and the south-west, or return, trade-winds are the most constant. In summer the heat of the sun is sufficient to drive back the polar winds to high latitudes, and in consequence south-west winds prevail; these, coming from the region of greatest heat and evaporation, bring heat and moisture; and

where they meet the polar currents flowing towards this area of low pressure, storms, clouds, fog, and very changeable winds occur.

As water presents no inequalities of surface, and absorbs and radiates heat very slowly, the ocean winds are more regular than those of the land.

The winds of the land are much more varied: the polar regions, especially the land within them, are areas of almost permanent high pressure, of cold, dry, heavy atmosphere. The winds flowing from them seek the nearest areas of low pressure—the oceans. Hence northern Europe and north-west America have north-east winds, and eastern Asia and America, north-west. In the lower temperate latitudes of North America, where the polar winds naturally tend to the south-west, the Rocky Mountains turn them aside, and they become north-west winds.

In winter, when the sun's heat is least and the nights are longest, polar winds prevail on both land and sea, and bring dry, clear weather with cold in addition.

20. Order of Winds.—When the return trade-winds and the polar winds come into conflict, sometimes the one is displaced, sometimes the other. “In the northern hemisphere generally, when the return-trade is displaced by the polar current, the wind blows successively from the west, the north-west, and the north, and settles in the north-east; in eastern North America, the north-west (see preceding section). When the polar wind is displaced by the return-trade, the successive changes are to the east, south-east, south, and finally to the south-west.

“In the southern hemisphere the order of transition is reversed: the north-west wind is the warm, moist return-trade, and changes by the west, south-west, and south to south-east, and from the south-east by the east, north-east, and north to north-west.”

Storms.

21. Causes of Storms.—The name *storm* is given to any sudden and violent commotion in the atmosphere, accompanied by winds moving at a high rate of speed, sometimes as high as 150 miles an hour, and often also by rain, hail, snow, and thunder and lightning. If a bonfire is made during calm weather, it is evident that air rushes from all sides into the area of low pressure thus formed, and a little observation shows that the inflowing air does not rush directly toward the fire, but approaches

it by circling round and round it,—just as water, when running out of a hole in the bottom of any vessel, is seen to circle round the hole before being drawn into it: the smoke and sparks whirl round and round as they go upward till they pass off into the upper air. The fiercer the fire, the more rapid the whirl—or, in other words, the greater the difference between the low pressure of this heated area and the high pressure of the surrounding area, the more furiously will the wind blow.

*The cause of storms is identical in character with the cause of the inflow of air to the bonfire, and the direction of the inflow of the air is the same in both. The movement of air from an area of high pressure to one of low pressure is circular in character. Such a circular movement is termed a cyclone.**

22. Phenomena of Storms.—In the centre of the storm is an area of low pressure, often hundreds of miles in diameter, in a state of quietude; around this the wind is circling more or less furiously—in the northern hemisphere, in a direction the reverse of that of the hands of a clock; in the southern hemisphere, with the hands.

Storms possess a forward motion in addition to the circular one. Starting, generally, within the tropics, a cyclone goes from a lower to a higher latitude—in the northern hemisphere, moving first towards the north-west till the limit of the trade-winds is reached, and then turning at right-angles and moving north-east with the return winds; in the southern hemisphere, moving first south-west, and then, from the limit of the trade-winds, south-east. In each case the cyclones die away in high latitudes.

In America, the cyclones, under the name of *hurricanes*, begin beyond the eastern West India Islands, cross to near Florida, and then, turning, sweep up the Atlantic coast, finally crossing over to western Europe and dying away. In south-east Asia the cyclone (called *typhoon*) starts in the northern part of the Indian Ocean, moves easterly and then north-east, dying away beyond Japan. In the southern hemisphere, near the Mauritius Islands, is another hurricane region; the cyclone rises in mid-ocean, passes westerly and then south-easterly.

A knowledge of this law of storms is useful to sailors; for, if caught in a storm, a captain can tell in what direction to sail in order to escape from it. If he is sailing in the northern hemisphere beyond the tropics, and encounters a north-east gale veering north, he will know the centre of the storm is to the south-east, and that the storm is passing to the north-east; he will therefore sail north-west in order to get out of its influence; if a northerly gale, the centre is to the east, and so on.

Tornadoes are cyclones on a small scale, varying in width from a few hundred feet to several miles; they are often as violent as the great cyclones and equally destructive. The Mississippi basin is subject to these tornadoes,

* From the Greek word *kuklos*, a circle.

which move north-east and sometimes reach Canada. If tornadoes occur at sea the violent whirl of the air draws up spray and water and thus forms *waterspouts*, so much dreaded by sailors; if they pass over deserts, sand-storms occur.

The origin of the areas of low pressure causing these violent storms, is unknown; but, from the position of their starting place, they seem to be connected with the change of monsoons, and also with the disturbing influences of large bodies of highly heated land. Two currents of air moving in opposite directions, when they meet will give rise to whirling motions, as do two currents of water. The suddenness with which tornadoes or cyclones come on, has led to the belief that they originate in the upper regions of the air through the force of conflicting currents, and then descend to the ground.

CLIMATE.

Causes affecting Climate.

23. By *climate* is understood the prevailing atmospheric conditions of any place—its degree of heat and cold, moisture, rain, snow, etc.; but as the phenomena of climate are ultimately dependent on heat, climate may be defined as those atmospheric conditions resulting from the amount and character of the distribution of heat in a given place.

24. *Curvature of the Earth.**—We get our heat from the sun in both winter and summer. We all know that the sun's heat is not so great in the morning and in the late afternoon as it is at noon. We see that the sun is higher up in the heavens—more nearly overhead—at noon than at any other time; we connect, and properly so, the height of the sun with the intensity of the heat.

In the diagram below, suppose that *ab, cd* represents a ray of heat from the sun at noon falling upon the surface *bd* nearly perpendicularly; and let *a'b, c'd'* be the same ray late in the afternoon; it is evident that in the latter position it will cover not only the surface *bd* as at noon, but also the additional surface *dd'*; as the degree of heat in the ray itself is the same in both positions, and as it has a greater surface to heat up in the latter than in the former position, it is evident that the surface *bd'* cannot be so warm as the surface *bd* when it alone received all the heat.

Other things being equal, the amount of heat derived from the sun's rays depends upon the degree of perpendicularity with which the rays fall upon the earth, whether at different seasons or at different parts of the same day.

In accordance with this principle, those parts of the earth where the sun is overhead or nearly so, viz., within the tropics, will be the warmest. The sun is much larger than the earth and gives out heat from every part; hence, if the earth presented to the sun a flat surface, the heat would be uniform everywhere; but the earth is spherical, and therefore presents an ever-retreating

surface to the sun's rays, so that they are received upon a more and more slanting surface as the distance from the tropics increases; or, in other words, a perpendicular to the earth's surface will point to a part of the heavens more and more remote from the sun as the distance from the tropics increases, so that when this

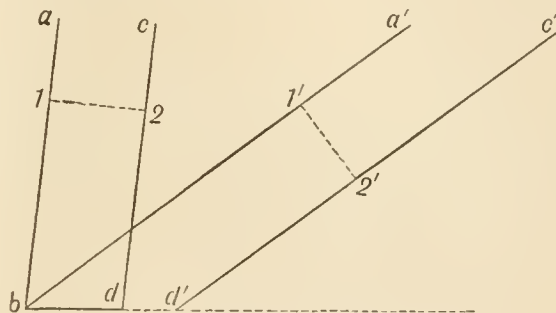


FIG. 25.—SUN'S RAYS.

perpendicular shows an angle of 90° with the sun's direction from it, the sun will be on the horizon, and consequently the heat derived from it will be very slight. It is therefore evident that the heat gradually diminishes from the region of a perpendicular sun to the region of a horizontal sun, that is, from the equatorial regions to the polar regions.

25. *Influence of Length of Day and Night.*—During the day the earth receives and radiates heat; during the night it radiates only; hence there is a gradual lowering of temperature during the night. Were the days and nights equal in length, the loss of heat during the night would be made good during the day; but outside the tropical regions there is every degree of dissimilarity in length, reaching, in the polar regions, its maximum of six months day and six months night. During the long nights in these regions the continual radiation produces an intense degree of cold, that leads to vast accumulations of ice and snow.

If the sun to any extent approached a perpendicular, the heat produced by the long days in these regions would be unbearable; but the heat is produced by a nearly horizontal sun, and is not sufficiently powerful to melt away the ice and snow of the winter. Canada, on the whole, lies midway between the tropics and the polar regions, and has what is called "*an extreme, or excessive climate*;" that is, in summer the days are so long and the height of the sun so great that the amount of heat produced is excessive; while in winter the long nights and the low sun produce an excess of cold. (See "Influence of Land," sec. 30.)

26. *Influence of Winds.*—Winds flowing from a warm region to a colder one carry the heated air far

*For remarks on the shape, motions, etc., of the earth, and the phenomena dependent on them, see "The Earth as a Planet."

beyond the place of its origin, and thus supply heat to places that would otherwise be deficient. The south-west winds of the northern hemisphere strike the western coasts of North America and Europe, and thus make those portions of the two continents warmer than the corresponding parts of the eastern portions. The winds of the polar regions also bring the cold air to places that otherwise would possess greater heat.

27. Influence of Ocean Currents.—The currents of the ocean that set towards the polar regions carry the heated waters of the tropics far up even into the icy seas themselves, and, both by warming the air that passes over them and by bathing the shores of distant countries, give rise to a climate much milder than that of countries remote from such influence. All western Europe is greatly affected by the surface drift-currents of the Atlantic, and by the Gulf Stream. On the other hand, the icy currents from the north, setting down along the east coast of North America, reduce the temperature below what it otherwise would be; similarly, the polar currents, that strike south-western Africa and South America, make these regions colder than the corresponding ones on the east side. (See "The Ocean," sec. 21.)

28. Influence of the Sea.—The sea absorbs heat less readily than the land, and radiates it less readily. Consequently the sea tends to make the climate of countries bordering on it less subject to extremes of heat and cold than that of inland countries. The winds from the sea reduce the heat of the neighboring land during summer, and mitigate the cold during winter. Hence maritime climate is never an "excessive climate," as inland climate often is. A maritime climate is also damp. (See "Influence of Land," sec. 30.)

29. Influence of Mountains.—Mountains affect climate in different ways. When they lie across the path of winds, the latter are forced up into the thinner and colder regions of the air, where, becoming chilled, much of the aqueous vapor they contain is condensed and falls in rain or snow; the winds, having thus become colder and heavier, fall to the plains on the other side, and give rise to a temperature quite different from that on the side from which they came.

The Rocky Mountains cross the path of the south-west return trades, as do also the mountains of Ireland and England; hence, the climate of the western part of North America and of Ireland and England is moister and warmer than that of the corresponding parts on the eastern side.

The Andes cross the track of the south-east trades, and consequently the eastern side is a region of almost constant rains, while so thoroughly has the aqueous vapor of the air been condensed out by the lofty mountains that a vast district in Peru is rainless, and elsewhere on the plateaus animal and vegetable remains do not decay, but dry up. A similar rainless district, from the same cause, occurs in the southern portion of the Rocky Mountain plateau.

The Western Ghats of India intercept the south-west monsoons, and during the prevalence of these winds south-western India is very wet, while in the Khasi Hills, north of Calcutta, occurs the greatest amount of rainfall known—over 600 inches per annum. The vast height of the Himalayas takes out nearly all the remaining moisture, and the rainless plateau of Gobi is the result.

Mountains are also barriers against cold polar winds. Thus, the mountains of southern Europe keep off the cold winds from the north, and a much warmer climate consequently exists to the south of these mountains; at the same time their southern slope presents a surface more nearly perpendicular to the sun's rays; this circumstance also tends to make the climate warmer.

As temperature decreases according to the height above sea-level, mountains present every variety of climate with the productions natural to each. Thus, within the tropics, the climate ranges from the extreme of heat at the base to the extreme of cold at the summit. (See "Heat of the Air," sec. 7.)

On plateaus the same conditions as to climate exist as are found on mountains: the lofty plateaus of South America and Mexico have a climate of perpetual spring, while a torrid climate exists at their base.

30. Influence of Land.—Apart from plateaus and mountains, the land surface of the earth modifies climate in its own way. It radiates heat more rapidly at one time than at another: in the night more than in the day. Consequently fluctuations in temperature are numerous. In winter the temperature sinks farther and more rapidly on land than it does on water: hence a greater degree of cold exists on the land than on the water; in summer the land absorbs more heat than the water, and thus becomes warmer.

Owing to the greater radiation of heat by the land, moist, warm currents of air from the sea often become chilled, and frequent rains are produced. The rainfall on the coast is greater than in the interior of a country, since part of the moisture of the air is condensed out when it first comes in contact with land.

Thus the tendency of land is towards a climate more or less excessive, at least outside the tropical regions.

The great variety of form in the land-surface produces an equally great variety in climate; local climates are innumerable; places a few miles apart, such as Toronto and Hamilton, vary considerably in climate, each having

its own physical conditions that affect it. (See also "Man's Influence on Climate.")

31. **Climatic Belts.**—It is thus seen that the conditions affecting climate are exceedingly numerous and varied, and that mere distance from the region of a perpendicular sun is but one, though an important one, of the factors in climate; other factors must be taken into consideration. In July the climate of California and Alaska is the same, though these places are wide apart in latitude; and in winter the cold of parts of Ontario is as great as that of Iceland or northern Norway. Only within the tropics, too, does there really exist a belt of equal temperature. This belt is of varying breadth, and shifts its position according to the season; in summer it

is almost wholly north of the equator, and extends, on the land and in the Atlantic, far beyond the northern tropic; but in winter, though the greater part of this belt is south of the equator, yet in but few places does it reach the southern tropic. This fact shows that the mean annual temperature is greatest in the northern hemisphere.

Any other division of the earth into zones or belts of climate must be arbitrary, except, perhaps, in the polar climates.

32. *Isotherms*.^{*}—Places that at the same season have the same temperature are said to have the same *isotherm*; and, on a map, the lines connecting such places are termed *isothermal lines*. Numerous observations with the thermometer, extending over many years, during all weathers, and in every variety of situation, are needed to determine the mean annual temperature of a place or its mean temperature at any portion of the year.

ORGANIC LIFE.

VEGETABLE LIFE.

1. **Conditions of Vegetable Life.**—Vegetable life is directly dependent upon light, heat, and moisture, for its existence, and to a large extent upon geological formation for its character.

It is found in practical farming that not all crops grow equally well upon the same soil; some grow best upon heavy, damp, or clayey soil; others, upon light, dry, sandy, or gravelly soil. Part at least of this difference arises from the chemical constituents of the soil, or, in other words, from the character of the mineral substances necessary for the frame-work of the plant, and found in the rock from which the soil has been derived by disintegration.

We find on the sheltered, sunny hillside, plants and flowers that we do not find where there is but little sun and no shelter; some plants dwindle and die unless exposed to the full rays of the sun, others perish unless in the shade; some live, and even flourish, in a long drought, while others require constant moisture.

What we may thus see within the bounds of a single farm, we find developed upon an infinitely grander scale upon the whole surface of the earth. The trifling differences in temperature on various parts of a farm, resulting from differences of exposure or elevation, are developed

over the earth into the exceedingly great contrast in temperature displayed by the tropical and the polar regions. Such extremes in temperature must of necessity produce equally wide extremes in plant life, from the gigantic growths of the tropics to the lowest mosses of the polar regions; between these extremes lies every variety of intermediate form. Ontario, though in latitude occupying the middle point, has yet more in common with the colder extreme than with the warmer; the summer heat, though often equal to that of the tropics, is yet of too short a duration to allow certain plants to come to the perfection that they attain farther south.

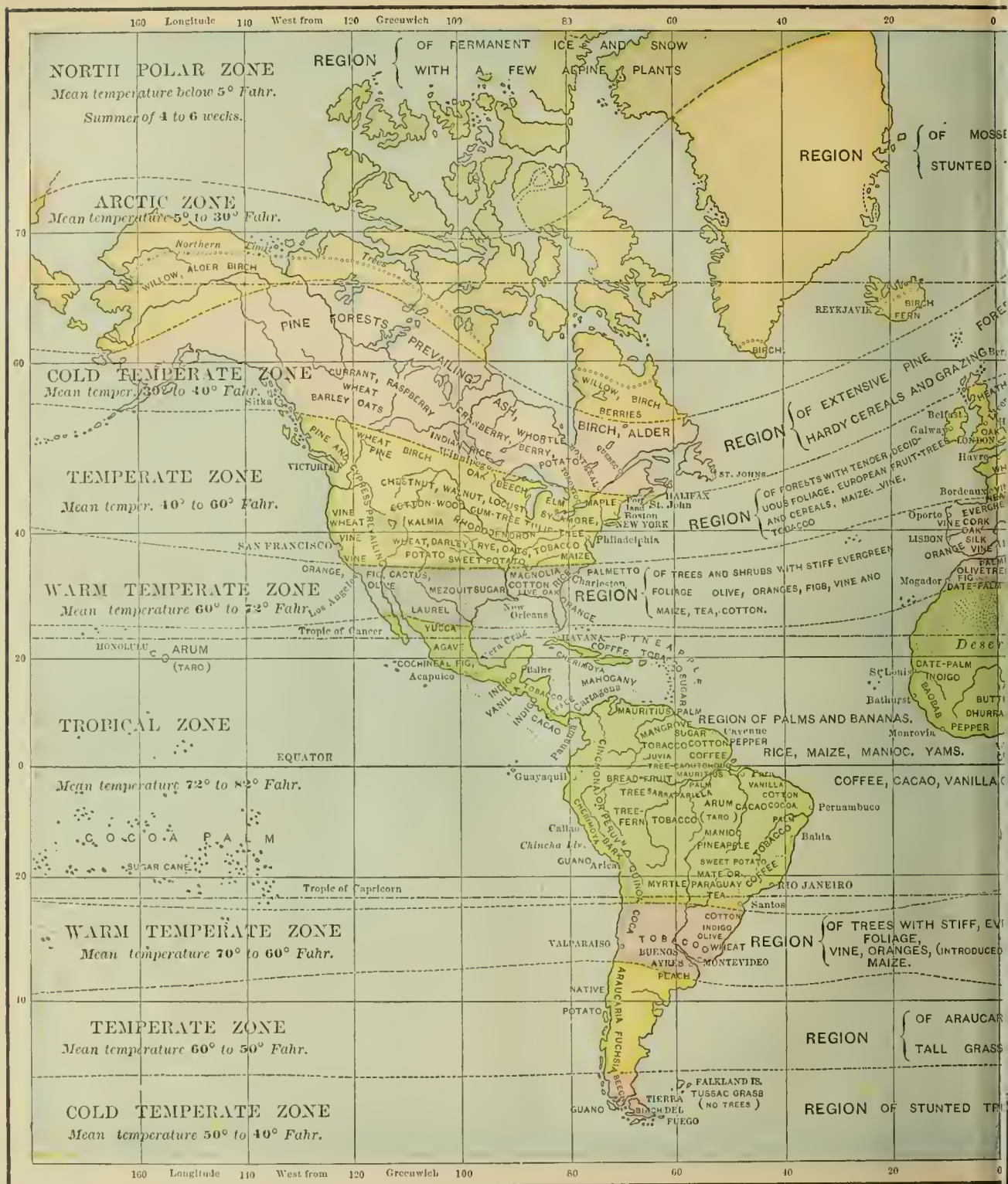
Moisture is essential, along with heat, for the support of plant life, and, like heat, has its extremes, which are also characterized by peculiar types of plant life.

Where heat is in excess, and moisture—whether in the form of rain, springs, or river-overflow,—is at its minimum, vegetation either wholly ceases or consists of plants, such as the thick, fleshy-leaved cactus of America, that absorb their needed moisture from the air.

Where heat is at its minimum (beyond the summer isotherm of 32° Fahrenheit), either in elevation or towards the poles, no vegetation exists.

Where moisture is in excess, either through rain or on account of the swampy character of the ground, the

^{*} From the Greek *isos*, equal, and *therme*, heat.





characteristic plants are of a soft, spongy nature, arising from their loose, open cell structure, and the large amount of water contained in their tissue; such are rushes, flags, and some grasses.

But where heat and moisture are both in excess—as they are in northern South America and in equatorial Africa—vegetable growth is at its maximum, not only in gigantic forms characteristic of excessive moisture, but in variety, abundance, and luxuriance, in delicacy of structure, and brilliancy of floral coloring.

Periodical moisture will be followed by periodical vegetation of certain kinds. On the steppes of southern Russia, in the plains of the upper waters of the Ganges, on the Kalahari desert of south-central Africa, and in very many other places more or less resembling these, the periodical rains produce a luxuriant plant growth, that gradually dies away with the cessation of rain and moisture, till nothing but a bare, barren waste is seen.

Such a state of deadness is analogous to our winter season.

Again, extreme, or excessive, climates

present features in plant life in marked contrast with those of moderate climates. The mean annual temperature, as a rule, regulates the character of vegetable growth; but some plants that require an excess of heat at an important stage of their growth are found to be better adapted to an extreme climate than to a moderate one with a higher mean annual temperature. Thus, England has a higher mean annual temperature than Canada, but certain fruits, such as peaches, grapes, and tomatoes, come to perfection here but not in England, for the heat of our summer—the critical period for fruit—is greater than that of England. On the other

hand, the greater severity of our winters destroys shrubs and plants that live unharmed in England. Likewise the moist air and more equable temperature of the British Islands produce a luxuriance and beauty of grass-growth that is impossible in Canada, where the summer heat parches the ground, the air is comparatively dry, and the frosts are so severe.

2. Zones of Vegetation.—Though no definite boundary can be laid down between the region of one species of plant and that of another, yet areas, separated to some extent in latitude or its equivalent in elevation,

are found to have each its characteristic forms. In adjacent areas the characteristic forms will be intermingled, but not in their fullest development: the place of fullest development will mark the centre of each area. Thus the area of cotton extends into Tennessee, where, however, the plant is stunted in growth, its fullest development taking place much farther south. Many scientific men, therefore, divide the surface of the earth into



FIG. 26.—VEGETATION IN THE PALEOZOIC (CARBONIFEROUS) PERIOD. (See Fig. 2.)

several belts or zones bounded by certain isotherms, not by latitude merely. Within each of these zones of temperature certain plant forms are predominant and characteristic, though two adjacent zones may have other forms equally characteristic of both. Each continent, moreover, has certain plants that are found nowhere else, and that thus characterize each, whatever other plants may be equally characteristic of the same zone in all. (See under each continent.)

1. The Equatorial Zone, bounded by the isotherm of 79°. It is the zone of maximum heat and moisture, and produces palms, bananas, cane, bamboo, climbing plants of huge size, parasites, etc.

2. **The Tropical Zones**, lying between the isotherms of 79° and $73\frac{1}{2}^{\circ}$ on each side of the equator. They contain palms, bananas, pine-apples, tree-ferns, cotton, sugar-cane, rice, pepper, etc.

3. **The Sub-Tropical Zones**, extending from the latter to the isotherm of 63° , are characterized by fig trees, some palms, cactuses, magnolias, laurels, myrtles. In this zone and the preceding ones the trees do not lose their foliage; in all three there are tracts of periodical barrenness.

4. **The Warmer Temperate Zones**, reaching as far as the isotherm of $53\frac{1}{2}^{\circ}$. Here the palms come to an end; and though there are evergreens still, yet trees that lose their leaves in winter (*deciduous trees*) appear, such as the chestnut and oak. Figs, olives, oranges, grapes, are at their best.



FIG. 27.—THE DATE PALM (N. Africa).

5. **The Colder Temperate Zone**, extending to the isotherm of $42\frac{1}{2}^{\circ}$, is the great zone of deciduous trees,—oak, beech, maple, elm, walnut. Beside these the cone-bearing trees, pines, firs, etc., exist in great forests. It is also the chief grain-producing zone.

6. **The Sub-Arctic Zone** extends to the isotherm of 39° . It contains pine, spruce, tamarack, beech, poplar, birch, willow, grasses, etc.

7. **The Arctic Zone** has stunted willows, alders, and birch, grasses, lichens and mosses, and the rhododendron.

8. **The Polar Zone** has chiefly lichens and mosses, some few willows and sassafras, but no trees or food plants.*

3. **Vegetation on Mountains**.—From what has already been said on climate, etc., it will be inferred that

vegetation passes through the same stages in vertical ascent as it does from the tropics to the poles. On the mountains within the tropics, however, there can be no excessive climate; there can be no alternations of summer's heat and winter's cold; the climate is comparatively regular in the same area, however much it may differ in areas of different elevation. Consequently we cannot expect vegetable characteristics identical with those of similar temperatures on plains where the climate is excessive. On the whole, however, similar temperatures produce similar vegetable forms, from the palms and gigantic grasses (bamboos, etc.) of the tropics to the lichens and mosses of the polar zone. In the temperate zones there will be no tropical vegetation.

4. **Oceanic Plant Life**.—The plant life of the ocean is restricted, but it depends upon the amount of heat and light it receives and upon the character of the bottom. Heat and light, especially the latter, vary with the depth of the water; plants, however, called *diatoms*, of exceedingly simple structure, have been found to exist at great depths, where there can be but little light or heat. The character of the plants depends on the depth of the water: one kind (*littoral plants*) will grow where the tide leaves the shore bare; another, just at low water mark; a third, beyond this again; and still another, as has been seen in the case of the Sargasso Sea, on the surface of the water itself.

The flora (or plants in general) of the temperate and the arctic seas is dull in color, while that of the tropical seas is often brilliant in hue, and most delicate in form.

ANIMAL LIFE.

5. **Dependence upon Vegetable Life**.—Vegetable life depends for its support upon heat, light, moisture, atmospheric air, and the soil. The three latter supply the food, the two former the chemical means by which, in connection with the mysterious principle called *life*, the crude, or inorganic, natural substance is transformed into organic substance, the home of life.

Animal life, on the other hand, though influenced by climate to a less degree than plant life, requires organic matter for its support. It must therefore depend directly or indirectly upon vegetable life: those animals that live on vegetable food are the prey of carnivorous animals.

Moreover it is found that some animals feed only on certain kinds of plants, and that if these plants disappear from any region the animals that feed upon them disappear as well. Also, if new plants

* Mainly from Page's Physical Geography.

appear in any region, the animals whose natural food these plants are will appear also. During those parts of the year in which vegetable growth ceases, and only the branches and fruits of some trees and shrubs are available for food, animals largely migrate to other countries where food is still plentiful, or become torpid till vegetation revives.

Again, a necessity of animal life is the gas oxygen; this is given off in large quantities by growing plants. On the other hand, animals give off from their lungs carbonic acid gas, a necessity of plant life, and they are also largely instrumental in spreading the seeds of plants.

But unlike plants, animals may range in search of food over wide areas varying considerably in point of climate. Hence animals are less dependent upon climatic conditions than are plants.

6. **Development of Animal Life.**—Where, therefore, vegetable life is at its fullest development, furnishing a constant supply of food in almost endless variety, there animal life is at its fullest development; consequently in the equatorial and tropical zones we find animals in the greatest number and greatest variety. As distance from these zones increases, the number of varieties becomes smaller, though the individuals are not markedly fewer. It does not follow, however, that where vegetable growth reaches its most gigantic proportions animals are of the most gigantic size, though such is the case in southern Asia and central Africa.

South America is devoid of large animals, as are also the East India Islands for the most part, while South Africa abounds in them, though its vegetable growth is neither gigantic nor profuse.

7. **Distribution of Animal Life.**—As in the vegetable world so in the animal. Each continent, though having types of animal life common to all the others, has its own peculiar forms whereby it is specially distinguished, notwithstanding similarity to the others in latitude, climate, soil, and lie of land. The reason for this peculiarity is not known, but it is evidently connected with

phenomena of former geological ages. The peculiarities are so marked that scientific men indicate six zoological regions, each with its own distinct forms, though where different regions meet characteristic forms intermingle.

Palæarctic (Old Arctic) Region comprises all Europe, Africa north of the Sahara desert, and Asia north of the Himalayas; it is the native home of sheep, horses, pigs, hedgehogs.

Nearctic (New Arctic) Region comprises North America north of the tropic of Cancer, corresponding almost exactly with the Palæarctic. Its peculiar animals are the prairie-dog, raccoon, opossum, skunk, mocking-bird, humming-bird, and some others. The domestic animals were imported from Europe, but the bears, wolves, foxes, deer, hawks, eagles, rabbits, thrushes, and many others of both regions, are closely allied.

Ethiopian Region comprises all Africa and Arabia south of the tropic of Cancer, and the island of Madagascar. Its peculiar animals are the rhinoceros, gorilla, chimpanzee, baboon, hyæna, lion, giraffe, ibis, flamingo, and guinea-fowl.

Oriental Region. Beginning with the mouth of the Indus this region comprises the country south of the southern slope of the Himalayas, and thence east to the Pacific, including Borneo, Sumatra, and Java. Some of its peculiar animals are the tiger, civet, orang-outang, and peacock, while the elephant, rhinoceros, crocodile, and many others are similar to those of the Ethiopian region, though not identical with them.

Neotropical (New Tropical) Region.—This includes all America south of the tropic of Cancer. It has no very large animals, but surpasses all the other regions in the variety and abundance of its life and in forms peculiar to itself. Some of its peculiar animals are the armadillo,

sloth, chinchilla, marmoset, llama, alpaca; humming-birds, the toucan, bell-bird, condor, etc. The serpents are numerous and often large, resembling in this respect the Oriental region; the lion and the elephant of the Ethiopian region are represented by the jaguar and the tapir; the crocodile, by the alligator; the ostrich, by the rhea; while the monkey tribe, common to the Ethiopian and Oriental regions, have here flat noses and prehensile tails.

Australian Region, including New Zealand and the islands east of Borneo and Java. Its animals are very remarkable, almost all of a low type of life termed *marsupials*, from having a pouch, which is formed by folds in the skin, and in which the young are carried. The kangaroo represents this class (Fig. 29). There are also the wholly peculiar platypus, the lyre-bird, and bird of paradise. The ostrich of the Ethiopian region is represented by the emu.

8. **Oceanic Animal Life.**—Animal life in the ocean is controlled by the same circumstances as that on the



FIG. 23.—CAINOZOIC MARINE ANIMAL LIFE. On the right is the *Ichthyosaurus* (fish-lizard or reptile); the fossil remains indicate sometimes a length of 30 ft., the jaws being 6 ft. On the left is the *Pterodactyl* (winged-lizard); it is devouring a *Pterodactyl* (winged-lizard). This latter sometimes measured 25 ft. from tip to tip of wing. (See Fig. 2, and "Building up of the Earth," sec. 5.)

land—food, and, to some extent, climate. It, too, is dependent ultimately upon vegetable life: for the little, often microscopic marine animals that are the food of



FIG. 29.—THE KANGAROO, (found only in Australia).

the larger ones, subsist either upon the shore or surface vegetation, or upon the minute vegetable matter that pervades the ocean either as living diatoms or as the result of the destruction of vegetable tissue by decay or by the force of the waves.

Of oceanic animal life but little is yet known. There are fish that live only at the mouths of rivers; others along the coast merely; some cannot live beyond a certain depth; others live only at a considerable depth.* Some are peculiar to warm climates, others to cold, and still others migrate.

The great food fishes—the cod, herring, salmon, and mackerel, are confined to the temperate and subarctic zones. The herring is caught at all seasons and in water of varying temperature; the cod is found only in very cold water; on some of our coasts it is caught close in shore in the spring, but it retires to deep water as the inshore water rises in temperature.

Bright-colored fish, sea-fans, corals, and sponges, as well as the larger bivalve and univalve shell-fish, are found only within the equatorial, tropical, and subtropical zones. Jelly-fish of all kinds reach their perfection in the same zones. During long continued calms, the water seems to corrupt, owing to the extraordinary multiplication and union into masses of this very low form of animal life. Only continued agitation by winds can keep the water pure.

The forms in the warm zones are not more gigantic than those in the cold zones. Excepting in the case of sharks, the temperate zones have no large marine animals. The sperm whale of the equatorial and tropical zones, is equalled in size by the right whale of the arctic zone, whose food, the "pteropod," a little mollusk of the size of one's finger-nail, swims in countless millions on the surface of the water. The walrus and sea-lion are unknown in warm seas, while seals of different kinds pervade the ocean everywhere.

* Recent explorations have proved the existence of animal life, though in lower forms, at the greatest depth sounded, 4,475 fathoms.

MAN.

9. Dependence upon Natural Productions.—The intelligence, or reason, of man, by which he is distinguished from the lower animals, enables him to adapt himself to the most varied circumstances of climate and production; he can provide himself shelter and subsist on the most varied food. In the wild, or uncivilized state, however, man is as directly dependent as other animals upon climate and local production: the Bushman of South Africa follows and subsists upon the herds of wild animals; the Eskimo, upon the marine animals of the north.

In civilized communities, where the wants go far beyond the mere supply of food, man is less directly dependent upon local production of food, but still he is dependent upon the resources of nature. The mines of one region furnish material to supply the wants of another region, which in its turn will supply the food or clothing that the former does not produce. The like can be said of forest regions. Other regions may be favorably situated for manufacture and commerce; these become homes of large communities, that exchange their manufactures for food or other articles needed. If the natural resources of a region become exhausted—as in the case of mines and forests—the people depart elsewhere; some parts of Maine have been deserted, and Nevada has recently lost two-thirds of its inhabitants.

Hence man in all conditions is dependent upon natural productions. In the savage, and consequently the most dependent state, climatic and food conditions influence him exactly as they do the lower animals. As civilization advances new wants arise which can be adequately supplied only by a division of labor; thus, while one man devotes his attention to agriculture, another will become a weaver, a shoemaker, a blacksmith, or a carpenter. The subdivision of labor renders mutual dependence greater; hence the tendency to settle in closer communities, or towns, by all who are not engaged in tilling the soil, and also the tendency of such communities to devote themselves as much as possible to the preparation for use of some one commodity, for which, as indicated above, natural conditions offer peculiar advantages—such as the existence of mines, forests, fisheries, rapid streams, or facilities for interchange of commodities.

10. Effects of Physical Conditions.—Temperature affects man as to the food eaten; animal food produces a greater amount of heat than does vegetable food. Hence the Eskimo and the tribes of Siberia are animal-eaters, while the tribes of the equatorial and tropical zones live chiefly upon vegetable food; those between these extremes have a mixed diet.

The extremes of climate are injurious to full development, mentally and physically; both heat and cold exhaust the vital functions; the heat of tropical countries

together with the lack of incentives to labor through the spontaneous production of food by the soil, leads to inactivity. In the polar regions the sole attention is directed toward providing food. In the temperate regions exertion is needed to assist nature in her productions, but not continuous exertion; the labor of a part of the year secures food and other requirements for the remaining part: systematic labor leads to active, industrious habits, and when activity and energy are not employed in gaining food they will be employed in other directions. Hence, all the great conquering, commercial, and civilizing nations of history belong to the temperate zones.

The races living on the seaboard are apt to be enterprising, daring, and commercial; those on fertile plains and lowlands will be industrious, agricultural, and not venturesome; deeming industrial pursuits of more importance than freedom, they are inclined to be submissive to rulers, and have always been readily overcome by conquerors. The mountain races have always been noted for their independence and their spirit.

"A damp, heavy atmosphere has a depressing effect on us, while a bright, clear one exerts an opposite effect. So a race whose home is in a dull or a bright climate, will partake of the nature of the climate. Frenchmen have a sunny climate, and they are lively; the English and Dutch have a heavy climate, and lack sprightliness." However, none of the Germanic races are vivacious, though living in a bright climate. The Celtic races are vivacious, though living in the damp climate of Ireland, or the bright one of France. The hot, burning regions of the deserts are said to make the people quick-tempered and fierce.

In physical frame man is affected by climate; it is said that the inhabitants of elevated regions have fuller chests and larger lungs than the people of low-lying lands, and that the dry climate of North America makes the body more shrivelled, dry, and sinewy than does the moist climate of western Europe.

11. Man's Effects on Physical Conditions.—"Man has introduced, as it were, an element of antagonism to Nature. . . . He has, with advancing civilization, engaged in a contest to subdue the earth and possess it. His warfare has often been a blind one, successful for the moment, but leading to sure and sad disaster." But latterly he attains his object, "not by setting Nature and her laws at defiance, but by enlisting her in his service."

On Climate.—By the removal of forests and the consequent exposure of the soil to the sun, rainfall is diminished, temperature is raised in summer and lowered in winter. Permanent injury has been done to countries bordering on the Mediterranean by the destruction of

forests; the soil in places has become parched and barren. In the West Indies similar results have followed like acts; and they are not unknown in Canada.

By draining, the water of rainfall is carried off more rapidly, and swamps, bogs, ponds, and lakes are removed, the result being that evaporation is lessened and temperature raised.

On Flow of Water.—The destruction of swamps, etc., causes a more rapid flow of water into the rivers, which often produces disastrous floods. Also, by the embankment of rivers the water is confined to the channel, and the sediment is all carried seaward. (See "Land Surface of the Earth," sec. 26.) By mines, wells, etc., the course, and consequently the effects, of underground water is changed.

On the Surface of the Land.—Forests are planted where none existed before; rivers are turned from their courses for irrigation or for reclaiming waste land; shallow arms of the sea are cut off by dykes and turned to dry land; breakwaters, piers, and embankments arrest the action of waves on the shore; canals, railways, mines, tunnels, and roads are being cut, and with the material new deposits are formed.

On Distribution of Life.—Here man's influence is most felt. Food plants and domestic animals have been transported from their native place to every quarter of the earth where they will thrive; while insects, mice, and rats follow wherever man goes. Hurtful beasts, and some not hurtful, and useless plants have been destroyed. As his knowledge of nature increases, those plants and animals in any part of the world that are found most useful to him, he will naturally seek to extend as widely as possible.

Thus, by his intelligence, man produces results that nature alone could not.

12. Types of Man.—Man has intermingled to so great an extent, and "the different varieties run into one another by such insensible degrees," that it is very difficult to make a satisfactory classification; but "there at least exist several definable types, each of which so far prevails in a certain population as to be taken as a standard." Thus in a community, amid the infinite variety of form and feature, certain characteristics are common to all the individuals, distinguishing them from every other community; and a group of communities in their turn may have some characteristic, common to each, which is not found in another group.



FIG. 30.—AUSTRALIOID TYPE.



FIG. 31.—NEGROID TYPE.



FIG. 32.—MONGOLOID TYPE.

The following classification is that suggested by Professor Huxley. It is based upon physical characteristics:—

1. *Australioid* (FIG. 30).—Having “a chocolate-brown skin, dark-brown or black eyes, black hair (usually wavy), narrow skull, brow-ridges strongly developed, projecting jaw, coarse lips, and broad nose.” This type is best seen in Australia and in some hill-tribes of Southern India.

2. *Negroid* (FIG. 31).—“Extending from Sahara to the Cape district, including Madagascar. Skin and eyes, dark-brown or black; hair, usually black, and always crisp and woolly; skull, narrow; brow-ridges, not prominent; projecting jaws; nose, flat and broad; lips, coarse and projecting. This type includes the Bushmen and the Negritos of the Andaman Islands, the people of Malacca, the Philippines, and other islands to New Caledonia and Tasmania.”

3. *Mongoloid* (FIG. 32).—“Extending eastward of a line drawn from Lapland to Siam (not including the Russians). Build, short and squat; yellowish-brown complexion; black eyes and black, straight hair; broad skull, usually without brow-ridges; flat, small nose; oblique eyes.” The Chinese and Japanese—both with narrow skulls—are included in this class, as are also the Eskimos of the Frigid Zone. It includes, also, the Malays, Polynesians, and American Indians, though varying considerably from the typical form.

4. *Xanthochroi*, or Fair Whites (FIG. 33).—“Tall; skin, almost colorless; eyes, grey or blue; hair, from straw-color to chestnut; skulls, of varying breadth.” The prevalent inhabitants of Northern Europe, traced also into Northern Africa and Hindustan.

5. *Melanochroi*, or Dark Whites (FIG. 34).—“Complexion, darkening to brownish and olive, and eyes and hair to black; stature lower and frame lighter than in the Xanthochroi type.” This type includes the people of southern Europe—Spaniards, Greeks, Arabs—and most of those usually called Kelts; it extends also into India. It shows large intermixture with the fair whites.

Another classification,—that of Blumenbach (1781),—gives the types as Caucasian, Mongolian, Negro, Malay, American. But more extensive knowledge has shown this to be a very faulty classification.



FIG. 33.—FAIR WHITE TYPE.



FIG. 34.—DARK WHITE TYPE.

A third classification, that of Professor Max Müller, is based upon similarities in language—the *Aryan*, or *Indo-European*, including all Europeans (except Finns, Lapps, Hungarians, and Turks), the inhabitants of Asia Minor, Persia, and India; the *Scutic*, including Arabs, Jews, and the races of a large portion of Northern Africa; and the *Turanian*, including the races of all Asia except the South-West and India, the Turks, Finns, Lapps, and Hungarians of Europe, the Eskimos, of the Arctic regions, and the various Indian tribes of America.

13. *Man as to Religion*.—The belief, however vague, in the existence of beings superior to himself, seems to be natural to man. No race, however degraded, has as yet been found without some idea of such beings; and the reverence paid to them, however varied may be the motives from which it arises, constitutes what is called

religion. The conceptions as to what these beings are, are extremely varied,—from dead men, devils, and the powers or objects of nature, to the Creator and Supreme Ruler of the universe. From the remotest times questions of religion have had a great influence upon men both as nations and as individuals.

The leading religions of the present day are:—

1. *Christianity*—the various sects numbering over 400,000,000,—professed by the most highly civilized and energetic nations. Its subdivisions, or sects, are Roman Catholic, the most numerous; Protestant; Greek Church (of Russia, Greece, Servia, Bulgaria, Roumania, and Christians of Turkey); Nestorian (of Persia); Abyssinian.

2. *Mohammedanism* embraces all south-western Asia, fully 30,000,000 of followers in India, all North Africa, much in Central Africa, and the Turks and Circassians of Europe. Its adherents are very numerous; there are at least 150,000,000.

3. *Judaism*.—The Jews form no nation, but are scattered, seemingly, over the whole world. It is estimated that they number at least 7,000,000.

Other religions are generally roughly classed as *Heathen*; but some of these religions are, in their pure form, of a very high character.

Brahminism, the followers of which number at least 225,000,000, in its purest form of Vishnuism, teaches a very high morality. It is confined to India.

Buddhism, followers of which are more numerous, it is thought, than those of any other religion, is an offshoot of Brahminism; it, too, when in its purest form, is of a high type.

14. *Man, Socially and Commercially*.—Man has been called a “gregarious animal,” that is, endowed by nature with instincts that lead to association in communities. Part of this tendency to association is due to the desire for safety, to mutual dependence, and to natural advantages for intercourse and manufacture. But the earliest histories of the race, as seen in the Bible narrative, and as deduced from language, show that communities first arose from the association of families—that is, kindred. The Israelites, Moabites, and others, are seen to have been descended each from a common ancestor. The same is inferred with regard to the Highland and the Irish clans; and archæological history shows the same in the various Germanic tribes—“Nottingham,” for instance, indicates the “home of the descendants of Nott.”

In the lowest types of man—those of the dense woods of Africa, of Australia, or of Tierra-del-Fuego,—whom we call *savages*, the instincts are scarcely above those of the mere brute. His sole object is the gaining of food and the providing of himself with weapons for hunting or warfare; indeed, the ability to provide himself with what he is lacking in by nature, viz., clothing, however rude, and implements by which he is assisted in gaining food or defending himself, is almost the only thing that distinguishes him from the brute; his regard for life is as little as that of the brute; his intellectual nature is dormant; he acts from instinct rather than from reason.

In the enlightened nations—those of western Europe especially—the intellectual and moral, or non-animal, nature is highly cultivated in all its varied tendencies, and reason, not mere animal instinct, is the controlling principle; the good of mankind, physically, morally, and intellectually, engages earnest attention, and the social relations are multitudinous and complex. All the resources of science and art, the productions—animal, vegetable, and mineral—of every country and climate, all the forces of nature are laid under contribution to satisfy the innumerable needs of this society. Such nations alone have produced effects upon the physical world, and such are the great commercial and governing nations of to-day.

Between these two extremes lies every variety of social and commercial condition. *Barbarous, semi-barbarous, semi-civilized, civilized*, are some of the vague terms used to indicate these different stages of social development.

15. *Man in Nations or Governments*.—It is held that nations had their origin in the family—in the association of kindred,—and that they have become enlarged by natural increase, by subjection and incorporation of some,

and by union on equal terms with others. Hence arise many of those peculiarities that distinguish different nations, and even whole communities within the same nation.

But nations and communities must have internal controlling, organizing, or governing principles of some kind, and these principles—or, what is the same thing, the extent and character of the power possessed by those who have the control,—constitute what we understand by *government*.

Types of Government.—As in the social relation so in the political relation there are extreme types. The lowest type of savage is almost “a law to himself,” and is restrained only by the fear of immediate physical suffering, or by the custom of his tribe, the chief having but little control. Such is the government in Australian tribes. But in other savage tribes, only a few degrees removed from these, the chief’s power is absolute—that of life and death;—such is found in many of the Pacific islands and among many of the African tribes. In some tribes the chief is regarded almost as a god, in others he is summarily deposed or put to death through mere caprice.

The *nomad* races, such as the Bedouin Arabs and the Tartars of western Asia, who wander from place to place with their flocks and herds, have a type of government termed *patriarchal*, the highest form of which is seen in the Bible narrative of Abraham, Jacob, and others, and, till within a hundred or so years, among the Highlanders of Scotland. In these the chief is regarded as the father of the tribe, caring for and governing it as a father does a family, and controlled only by well-established custom.

In a more settled or more highly organized state the patriarchal government passes into the *Monarchical*, such as is seen in the Biblical account of the Jews after their settlement in Canaan, in the history of the Tartar races of Asia, and of the Saracens of Arabia.

This form of government shows two distinct classes: one, the Absolute Monarchy, in which the laws controlling the nation are in the main written, but in which the chief ruler, whatever his title, is superior to the law, and can, of his own authority, make or abolish laws. In these governments the nation at large has no control, though the ruler is usually guided by ministers or by custom. Such governments are seen in Persia, China, in many of the states of India, in Farther India, Turkey, and Russia,—Persia showing the extreme of absolutism, and Russia the tendency to constitutionalism. In the second class the monarchs are controlled by written absolute law, by ancient custom, and by the enactments of the nation through its representatives, assembled as a national controlling council. These are *Constitutional Monarchies*, the constitution (or body of laws regulating the duties and powers of governor and governed) of each country defining more or less distinctly the powers of the ruler. These powers are different in different countries—in Germany they border on absolutism, in England they are exercised by the ministers.

The remaining form of government—the opposite extreme to the savage—is the *Republican*. In this the chief ruler does not hold his office for life as in other forms of government, but for a number of years fixed by law. His powers are also fixed by law, and are different in different countries. In the United States, for instance, they are greater in some respects than those of the sovereign of England. The chief ruler as well as the legislators are chosen directly or indirectly by vote of the nation.

16. *Relationship of Countries*.—Countries may stand in different relationship to each other politically.

They may be wholly independent. One may be wholly merged in another. They may have the same sovereign but be independent in other respects, as Norway and Sweden. They may form a federation, each country controlling its own local affairs. One may be a dependency of another, or a colony having more or less control of its own affairs.

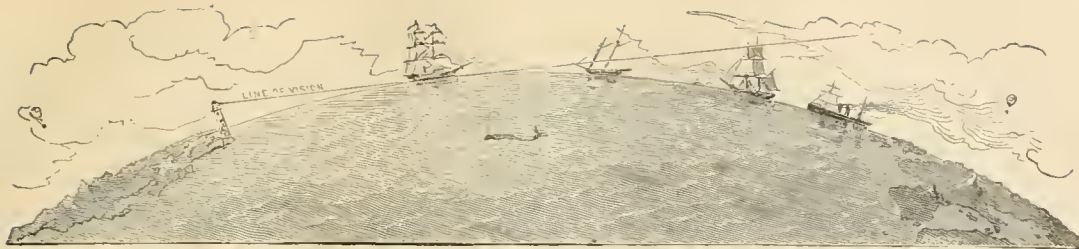


FIG. 35.—SHOWING ROTUNDITY OF THE EARTH.

THE EARTH AS A PLANET.

1. The phenomena of the earth in connection with land, water, air and life, and their mutual relations, are for the most part matters of common observation open to each of us. But the relation of the earth as a whole to the rest of creation, its position in that creation, and the causes of many of its phenomena, are not open to common observation, but they have been established by long and patient investigation or are still matters of theory. We have therefore to accept as fact what has been established as fact by eminent men, but to receive only as theory what has not been proved to be *fact*, however deep the research that led to the theory.

2. **Shape of the Earth.**—The spherical shape of the earth is one of the facts fully established by astronomers. Allowance being made for imperfection of sight and consequent optical illusions, the ground beneath and around us seems flat, although many of the observed phenomena would be wholly inexplicable were the earth truly so. Among such phenomena is the extended range of vision from higher ground, which brings into view distant objects that, though of large size, have but little elevation, while those of smaller size but of greater elevation are clearly seen from the lower ground. The following, among others, are proofs of the spherical form of the earth:—

Where the surface is unbroken, on great plains and on the sea, the view is unobstructed; but yet this surface seems to have a definite boundary-ring, beyond which nothing can be seen. A glass only brings nearer this ring (or *horizon*,*) which is found to be about three miles distant. If we ascend a hill or high building the boundary is still seen but farther away. In every direction, and everywhere on the earth, the same appearance is noticed. Only a spherical body could produce such an effect.

It follows from this that tall objects, if beyond this boundary, will have their lower parts hidden, while the upper may be visible;

hence, on plains the tops of trees, and on the sea the sails of vessels are seen at a greater distance than larger objects on the surface.

If the earth were spherical we might travel continuously in any one direction without encountering abrupt changes in inclination, and arrive at last at the place from which we started. Such has been done in effect.

In an eclipse of the moon the shadow of the earth, no matter in what position, is circular. Only a spherical body could produce this uniformity of shadow.

Other heavenly bodies are spherical, therefore it is reasonable to infer that the earth is spherical also.

The above facts prove the general form of the earth to be spherical; the following are two proofs that the earth is not *perfectly* spherical:—

On different parts of the earth—in South America, India, Egypt, Russia, Norway, and others—the length of a degree on a meridian (see Sec. 11,) has been accurately measured, and the result has shown that in the equatorial regions the length of a degree on a given meridian is less than it is in the polar regions. In Sweden it is found to be 365,744 feet; in India, 362,956 feet. On a perfect sphere the length of a degree, measured on the same circle, is everywhere the same; the earth, therefore, cannot be a perfect sphere. The greater length of a degree on a meridian in the polar regions shows that the degree there is the arc of a larger circle, and hence has a more gradual curve, or is flatter.

It is found that the pendulum of a clock, marking seconds, say at Winnipeg, will, at the equator, be found to mark a somewhat longer space of time; in other words, it will *lose time*; while a clock, marking seconds at the equator, will mark less than seconds at Winnipeg, or it will *gain time*. The attraction of gravity causes the pendulum to swing, and the nearer to the centre of attraction it is the faster it will swing. It swings faster at Winnipeg than at the equator; hence, Winnipeg is nearer the centre of gravity—that is, the centre of the earth—than is the equator. But all parts of the surface of a perfect sphere are at the same distance from the centre; the earth is therefore not a perfect sphere.* As the flattening takes place principally towards the polar regions, the shape of the earth is that of an *oblate spheroid*.

3. **Size of the Earth.**—The polar circumference of the earth is determined by measuring a degree on a meridian, and the equatorial circumference by measuring a degree on the equator, in each case the result being multiplied by 360, the number of degrees in a circle. The diameter

* Each of the facts above referred to requires much fuller elucidation than can possibly be given here. The teacher should consult the article "Earth," in the *Encyclopedia Britannica*, and refer to Lockyer's *Astronomy*, Huxley's *Physiography*, and Geikie's *Physical Geography*.

* From the Greek word *horizo*, to bound.

will be found by applying the well-known ratio between diameter and circumference. The *mean circumference* will be about 24,858 statute miles (25,000 in round numbers), and the *mean diameter* 7912.409 miles (8,000 in round numbers), the equatorial diameter being about $26\frac{1}{2}$ miles longer than the polar diameter. The equatorial diameter is 41,848,380 feet; the polar diameter, 41,708,710 feet.

The mountains are so small in comparison with the size of the earth that they make no appreciable difference in the appearance of the earth as a whole.

The area of the earth may be readily calculated from the data given above.

The cause of the difference between the equatorial and the polar diameter has not been fully determined. The Nebular theory would explain it. The fluid mass of the cooling, revolving earth would tend, in accordance with a well-known law, toward the part that revolved most rapidly, viz., the equator; and when this fluid mass solidified the equatorial regions would be left in a bulging form.

4. Motions of the Earth; Diurnal Motion.—The sun, our source of light, is not always present to us or in the same direction from us; at night the same change in the position of other heavenly bodies is observable also. Either the earth turns round or the whole heavens do. The revolving of the earth is the simpler explanation of the phenomena; that the earth does revolve is proved by astronomers and demonstrated by experiment.* A revolution (from west to east) takes place once in twenty-four hours (23 hrs., 56 min., 4 sec.), and causes the phenomena of day and night.

The part about which all other parts seem to revolve is termed the *axis*; and the points on opposite sides where this axis is at the surface are called the *poles*. It is evident that the nearer a place is to the axis (or poles) the more slowly it will revolve; it has to describe a smaller circle in the same time in which a more remote point describes a larger one.

It is evident that the heads of those dwelling on the opposite side of the earth to us (the *antipodes*) point in a direction the reverse of what ours do; but the heavens are all around the earth and consequently the heads of the antipodes point to the heavens. *Up* means away from the earth; *down*, towards the earth; hence these terms, though in one sense the same to us and the antipodes, in another are exactly the opposite. But like everything else on the earth, the antipodes are held to the earth by *attraction of gravity*—that property of all matter by which each body attracts all others with a force directly as the weight, and inversely as the square of the distance asunder. Were the earth to cease revolving, everything on its surface would shoot off with fearful velocity: at the equator the rate of speed at which objects move is over a thousand miles an hour. Were the earth to lose its attractive power, anything impelled from it would go to the object that exerted the strongest attractive influence.

5. The Earth and the Sun; Annual Motion.—Astronomers have also proved that the earth, besides revolving on its axis, revolves around the sun once in $365\frac{1}{4}$ days (365 days, 6 hrs., 9 min., 10 sec.)—one such revolution being called a *year*. This revolution, together with the position of the earth's axis, produces the

phenomena of the seasons, and the different lengths of day and night.

The path of the earth around the sun is called its *orbit*; the figure that it describes is not a perfect circle, but an *ellipse*,—the sun being somewhat nearer one end than the other.

Now, if the axis of the earth were perpendicular to the space enclosed within this ellipse,—called the *plane of the earth's orbit*,—it is evident that day and night would be equal over the globe from north pole to south pole; for the sun being much larger than the earth, and casting out light from all parts of its surface, floods with light the half of the earth turned towards it.

It is evident, too, that there would be no change of season in any place, for the sun's position would never vary with regard to any place,—the heat would gradually decrease from the torrid of the equatorial zone to the frigid of the polar zones; each place would have one unvarying climate the year round.

But these are not the phenomena we have. It is found that the axis of the earth is $23\frac{1}{2}$ degrees from a

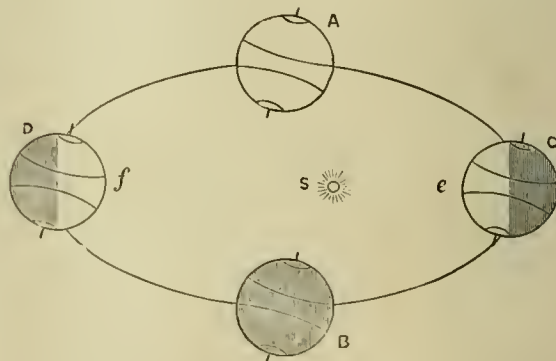


FIG. 36.—DIAGRAM OF SEASONS.

perpendicular to the plane of the orbit, and moreover that the axis points always in the same direction,—its position at any one time is always parallel to its position at every other time. On these facts depend the phenomena of seasons and of inequality in day and night.

Hence it is seen that at one time (June 21st) the north pole of the earth will be inclined $23\frac{1}{2}$ degrees toward the sun, and the light of the sun will shine $23\frac{1}{2}$ degrees over the pole in consequence; but as only one-half of the earth can have light at the same time, therefore the light does not reach the *south* pole by $23\frac{1}{2}$ degrees, and also the sun must be perpendicular at a spot half way between these extremes of illumination, or $23\frac{1}{2}$ degrees north of the point midway between the poles—at the *Tropic of Cancer*. (See D in diagram.) This position of the sun will give the greatest heat to the northern half of the earth and produce Summer, while the southern half will receive the least heat and have Winter.

* See Lockyer's Astronomy.

As the earth passes onward, in three months (Sept. 21) it arrives where the north pole will point neither to nor from the sun: consequently the limit of illumination will be at the poles,—day and night are of equal length,—we have the *Autumnal Equinox*, and the *change of Seasons*. (See "Atmosphere," sec. 16.) Still passing onward, the earth in three more months (Dec. 22) reaches a position where the north pole points away from the sun 23½ degrees, and consequently the sun's light will not reach this pole by the same number of degrees: but, half of the earth is still in the sunlight, and therefore the sun shines 23½ degrees beyond the south pole and is perpendicular half way between these extremes of illumination,—at the *Tropic of Capricorn*. Then there is summer in the south part of the earth and winter in the north. In three months more (March 21) the earth will again be where the north pole points neither in the direction of nor away from the sun, and again day and night are of equal length—we have the *Vernal Equinox* and another *change of Seasons*. Three months more finds the north pole again pointing towards the sun.

6. **Inequality of Day and Night.**—By the diagram (fig. 36) it is seen that in the position D the north pole is in continual light, and the space around it for 23½ degrees—that is to the *Arctic Circle*—is also in continual light. The sun seems to revolve on, or a short distance above, the horizon. A little way beyond this point it is evident that the sun will be invisible for a short time—it will disappear below the horizon and soon reappear—consequently the night will be very short and the day very long. A few degrees farther away the night will be sensibly lengthened and the day proportionally shortened, but still the day will be much the longer. Finally, where the sun is perpendicular, at Cancer, day and night are equal; beyond this point the state of things is reversed and the nights are longer than the days, till at 23½ degrees from the south pole, viz., at the *Antarctic Circle*, continual night is found. The progress of the earth's revolution round the sun gradually reverses these conditions, and then restores them again.

When the earth reaches B (see diagram) the north pole enters the light and remains in it for six months. Thus this pole has six months of day and consequently of night also; places removed from it have shorter periods of continuous light.

It is evident therefore that when the sun is perpendicular at Cancer—the *Summer Solstice*,* the places north of that tropic have their longest day, and when it is perpendicular over Capricorn—the *Winter Solstice*, the same places have their shortest day; in other words, at the Summer Solstice the sun will be highest in the heavens to places north of the Tropic of Cancer, and lowest in the heavens when the sun is at the Winter Solstice. Our Summer Solstice is the Winter Solstice for those south of the Tropic of Capricorn.

7. **Why the Earth's Motion is Circular.**—It is a law in nature that when a body is acted upon by two forces, not in opposite directions, it will obey neither, but move in a straight line between them. The earth is such a body; it is acted on by a force that propels it forward, and also by the attraction of the sun; it obeys neither fully. If the force of propulsion and that of attraction had each acted but once and then ceased, the earth would have gone onward in a straight line; but both forces are in continual action, and as the earth in consequence has to continually change its course, circular motion is the result.†

8. **Distance of Earth from the Sun.**—The greatest distance of the earth from the sun—or when the earth is in *aphelion*‡—occurs at the summer solstice of the northern hemisphere, 92,963,000 miles, and its least distance—*perihelion*‡—at the winter solstice, 89,897,000 miles, the mean being 91,430,000 miles.

Although the earth is nearer the sun by three millions of miles at one period than at another, yet this greater

proximity to the source of heat is, in the northern hemisphere, more than counterbalanced by the oblique surface on which the rays fall. In the southern hemisphere, it is fully counterbalanced by the greater mass of water, and by the shorter period during which the sun is perpendicular. Were the mass of land as great in the southern hemisphere as it is in the northern the temperature in the former would be higher in the summer and colder in the winter than at present.

It is evident that the northern hemisphere receives direct rays of the sun for a longer period than the southern does; for as the earth is 3,000,000 of miles farther from the sun at the summer solstice than it is at the winter solstice, this difference of distance must be traversed twice while the north pole is inclined in the direction of the sun, or, in other words, is in continuous light. The earth, too, moves more rapidly from the time of the autumnal equinox to the time of the vernal equinox than it does from the vernal to the autumnal.

At the summer solstice the earth turns its course somewhat in the direction of the sun; the force of propulsion and the sun's attraction are then acting in a measure together. The rapidity of the earth's motion is consequently increased, so much so that at the autumnal equinox it is so great that it overcomes the sun's attraction, and the earth passes by the sun. The two forces are now opposed; but the sun's attraction gradually overcomes the other, till at the winter solstice, it turns the earth, in a circular course, back again. Once more the two forces are acting somewhat in concert, and the earth's motion increases in rapidity,—but to a greater degree than before, since the earth and sun are now nearer each other by 3,000,000 miles. In consequence of this, at the vernal equinox, the earth passes by the sun with greater rapidity than at the autumnal equinox, and goes 3,000,000 miles further from the sun than before, ere the sun's attraction again checks it at the summer solstice. In this latter position it is evident that not only is the distance to be travelled back again greater than that between the winter solstice and the vernal equinox, but the attractive force of the sun is lessened, and the motion of the earth consequently slower—circumstances that keep the northern hemisphere in the direct rays of the sun for a longer time than the southern.

9. **The Planets.**—The earth is but one of a number of bodies that revolve around the sun receiving their light and heat from it. This collection of heavenly bodies, so related, is termed the *Solar System*, and each is called a *planet* in contradistinction to the *stars*,—other heavenly bodies that do not revolve around the sun.

The solar system is believed by astronomers to be itself revolving around some other centre in the remote heavens.

The following table gives the names and some other facts in connection with the planets of the solar system:—

Names and Order of Planets.	Diameters in English Miles	Distance from Sun in Miles.	Revolution in Days.	Rotation in Days and Hours.			No. of Satellites.
				D.	H.	M.	
Sun.....	853,380	.....	.....	25	0	16	..
Mercury.....	3,058	35,392,000	87.969	1	0	5	..
Venus.....	7,510	66,184,000	224.700	0	23	21	..
Earth.....	7,926	91,430,000	365.256	1	0	0	1
Mars.....	4,363	139,311,000	686.979	1	0	37	2
Asteroids.....	.....	200,000 000	2,000,000	.....	.....	.....	.....
Jupiter.....	84,846	475,692,000	4,332.84	0	9	55	4
Saturn.....	70,136	872,137,000	10,759.219	0	10	29	8
Uranus.....	33,247	1,753,869,000	30,689.820	0	9	30	4
Neptune.....	37,276	2,745,998,000	60,126 720	.....	.....	.....	1

Most of the planets are attended by one or more smaller bodies that revolve around them, and that reflect upon them the light received from the sun; such secondary planets, or *satellites*, are called *moons*. Our moon is 238,000 miles distant, 2,160 miles in diameter,

* From the Latin *sol* the sun, and *sto* to stand.

† See Lockyer's *Astronomy* for the causes of the elliptical character of the orbits of planets.

‡ From the Greek *apo* away, *peri* around or near, and *helios* the sun.

and revolves around the earth in 27 days and 8 hours—in round numbers, 28 days—a *month*.

From appearances presented by the moon when viewed through a telescope, many astronomers believe that planet to have passed through the various stages that the earth has passed through, and to have become at last dead, there being no atmosphere and no water. The planets Mars and Venus, on the other hand, present every appearance of being like the earth.

10. Direction, Distance, Time.—In order to indicate direction there must be some fixed point established. The North Star supplies this need; it is always in the same spot in the heavens; the north pole always points to it at all seasons of the year—a fact that shows the inconceivable distance of the star. Direction towards this star is called *north*; opposite it, *south*; towards the right, when facing the star, *east*; towards the left, *west*; intermediate points go by different but descriptive names.

Fixed places are also needed from which to indicate distance. These are supplied in the poles. In mathematics a circle is divided into 360 parts, called *degrees*; and as the shape of the earth is that of a circle (or thereabouts), its surface is said to be divided into degrees, hence from the north pole to the south pole would be 180°, and half way between them 90°; this latter place is termed the *equator* (*i.e.*, *equalizer*); distance from this, north or south, is termed so many degrees from the equator, or so many degrees *north* or *south latitude*. The half of the earth north of the equator is termed the *northern hemisphere* (*half sphere*), the half south of the equator, the *southern hemisphere*.

To determine distance east and west, or *longitude*, a certain place has to be fixed on by common consent, no natural position existing. Each country has usually selected its own capital as the starting point, but most nations of Europe and also of America have lately agreed upon Greenwich, London. Any place east or west of Greenwich, or of places directly north or south of Greenwich, is said to be in *east* or *west longitude* respectively. As longitude extends half way round the globe, *east* and *west* longitude will meet at 180° from Greenwich.

Time, apart from the year and month, is reckoned from the moment the sun reaches the highest point in the heavens; all places that have the sun in this position at the same moment (*noon*) are said to be under the same *meridian* (*i.e.*, *mid-day*); and, as every place has a mid-day, every place will have a meridian. To us north of the Tropic of Cancer the sun is in the south when at its highest point; to those south of the Tropic of Capricorn it is in the north; between the tropics it is in the north or south, or perpendicular, according to the season; at the tropics it is perpendicular, or to the south of Cancer and to the north of Capricorn, according to the season. As time is reckoned from meridians, no two places can have the same time unless they are on the same meridian.

As this latter fact has been found attended with inconvenience in railroad and steamboat travel and traffic, certain meridians (in America

the 60th, 75th, 90th, 105th and 120th) have been selected as *standards* from which to reckon time, one hour's difference (*i.e.* fifteen degrees of longitude) existing between the time of each standard; all places between these standards having the same time. All the chief towns on commercial routes have adopted this scheme instead of adhering to their own local time.*

11. Maps of the Globe, etc.—In a picture of the globe the outline will be a circle; a line indicating the equator will be straight, as will also a line drawn at right angles to the equator from the north to the south pole. The eye is supposed to be fixed upon the intersecting point; hence all other lines representing meridians, or degrees of latitude (*parallels*) will be curved as they appear to be when drawn on a hand-globe.

On a hand-globe meridian lines, or circles, and the equator have the centre of the sphere as their centre, but parallels do not; the former are *great circles*, the latter *small circles*. The lines indicating the tropics (or solstices) and the lines indicating the extreme limit of illumination over the poles (*polar circles*) are also small circles.

As each circle has 360 degrees, one degree upon a *great circle* must be longer than a degree upon a small circle. Hence a degree on the earth along the equator or along a meridian is longer than a degree upon a parallel of latitude or the tropics or polar circles.

The following table gives the distance in miles along the equator and along certain parallels, *i.e.* degrees of longitude:—

TABLE SHOWING THE LENGTH OF A DEGREE OF LONGITUDE FOR EVERY 5 DEGREES OF LATITUDE IN GEOGRAPHICAL AND ENGLISH MILES.

Deg. of Latitude.	Geog. Miles.	Eng. Miles.	Deg. of Latitude.	Geog. Miles.	Eng. Miles.
0	60.00	69.07	50	38.57	44.35
5	59.77	68.81	55	34.41	39.58
10	59.69	67.95	60	30.00	34.53
15	57.96	66.65	65	25.86	29.15
20	56.38	64.84	70	20.52	23.60
25	54.38	62.53	75	15.53	17.86
30	51.96	59.75	80	10.42	11.98
35	49.15	56.51	85	5.23	6.00
40	45.98	52.85	90	0.00	0.00
45	42.34	48.78	..	.....	.....

Between the tropics and the polar circles lie the so-called *temperate zones*. Between the tropics, the *torrid zone*; within the polar circles, the *frigid zone*.

* See Lockyer's *Astronomy* for a full account of the complex character of time; and also for *solar*, *mean solar*, and *sideral* time.

POLITICAL GEOGRAPHY.

THE NEW WORLD, OR WESTERN HEMISPHERE.

GENERAL REMARKS.

The term "New World" merely relates to the discoveries of Columbus, who, in reality, gave a *new world* to Europe. In other respects America is at least as old as either of the other continents. The Laurentian are the oldest stratified rocks, and they form a very large portion of the northern half of the continent. Not only do they do this as a mass, but they reappear in both of the axes in long, narrow bands here and there throughout a great part of their length, thus roughly outlining the continent from the first.

"Western hemisphere" indicates that half of the earth's surface lying west of Europe, contained within the meridians of 20° west longitude and 160° east longitude.*

The name "America" perpetuates a mistake. The first to describe in a book the newly discovered land, was Amerigo Vespucci, a companion of Columbus on his first voyage, who afterwards became an explorer himself and published the first account of the discoveries.

A striking feature of America is the vastness of the scale on which the physical features are constructed, and at the same time the simplicity of the plan;—huge mountain-crowned plateaus, that stretch from end to end of the continents; plains, whose breadth and length are measured by thousands of miles, and whose waters collect in streams unequalled in length and volume, or, before passing off in rivers, form the mightiest lakes in the world;—a plan the same in both continents—a great plateau, with mountain chains close to one side; a supporting, but inferior, divergent chain on the other, with the whole of the enclosed space a low-lying plain, the coastline being practically unbroken.

In extent it encircles nearly half the earth, stretching from the icy regions of the one pole to the borders of those of the other. Exposed to every variety of climate, it is yet free, almost wholly, from those physical conditions that have reduced vast regions of Africa and Asia to barren wastes. No such deserts as those of Arabia and Beluchistan are seen, still less such as Sahara and Gobi. Everywhere, except where rigorous cold forbids, the soil will repay man for his labor. It is only to be regretted that the same, or an equally energetic, race as the one that now peoples the northern portion, did not fall heir to the whole continent, seeing that so great a part of the indigenous races were incapable of further advancement, and disappeared before the incoming strangers.

The great cleft of the Gulf of Mexico, which almost severs the continent of the New World, is paralleled by that of the Mediterranean of the Old World. But the two regions thus formed in the latter, at least in proximity to the dividing water, are not unlike, either in their vegetable or their animal productions; while in the New World the dividing water marks a decided difference, as well in animal life as in vegetable life. The extraordinary exuberance of vegetation, and the equally gaudy coloring of the multitudinous varieties of insect and bird of the southern division, are in marked contrast with the dark forests and generally homely color of insect and bird in the northern half.

The introduction of the Old World peoples into the New was necessarily followed by the introduction of those plants and animals upon which they had been accustomed to rely for sustenance. The lapse of years, however, has developed in these plants and animals a distinct variation from the original types, as it has also in man himself,—the result of some as yet undiscovered peculiarity existing in air or soil.

* Had the Chinese discovered America, they would possibly have called it the "Eastern hemisphere."



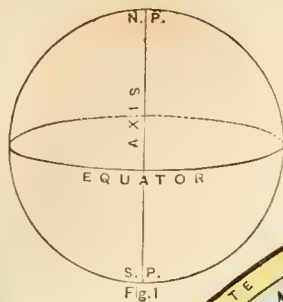


Fig. 1



Fig. 2



Fig. 3

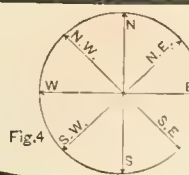


Fig. 4

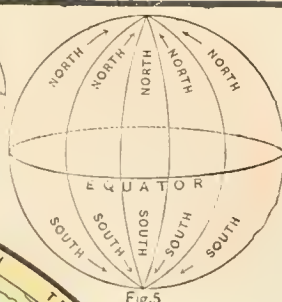


Fig. 5



Fig. 6



Fig. 7



Fig. 8



Fig. 9

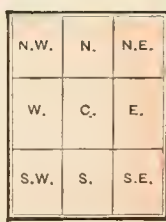
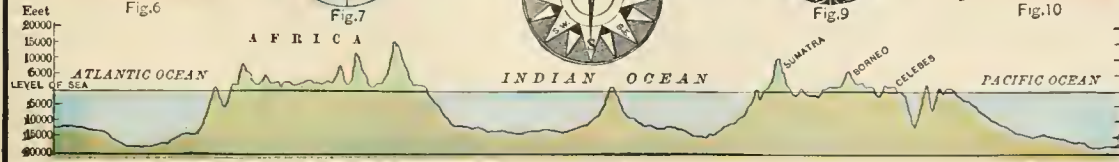


Fig. 10



NORTH AMERICA.

1. **Structure.**—The general plan of the structure of the Continent is given in Part I., secs. 4, 14, 15.

The great plateau of the western side increases in height from about 800 feet near the Arctic, 8,000 feet in Mexico; its greatest breadth is about 600 miles. From the eastern border of the plateau rise the Rocky Mountains in several parallel chains, connected by cross ranges, the highest peaks, rising from 12,000 to 15,000 feet above the sea, being found between the parallels of 35° and 40° north latitude. On the western side are the Sierra Nevada to the south, and the Cascade Mountains to the north, their eastern slope being abrupt, but the western long and gentle. The highest peaks of the former are from 10,000 to 15,000 feet; the latter are lower but contain volcanic cones, some still active. The culminating point on the continent is Mount St. Elias, 17,900 feet.

There are also several low ranges, called coast ranges, between the plateau and the ocean; these, in British Columbia and Alaska, consist in part of islands.

The eastern axis of the continent begins with the plateau of Gaspé (about 1,500 feet high) and ends in Alabama, the lowest part being near the centre of the system, and the highest towards the south and the north. On each side the descent is gradual. The culminating point is Mitchell's Peak (6,782 feet) in North Carolina.

The great Laurentian area determines the whole of the physical features of north-eastern America. (See under "Canada.")

The great central plain is divided into two basins or slopes by the "height of land" that runs irregularly across the continent in the neighborhood of the fiftieth parallel, seldom exceeding a thousand feet in height. (See "Canada" and "United States.")

2. **The Rocky Mountains.**—The Rocky Mountains show a regular succession of sedimentary rocks, from the lowest Palæozoic up to nearly the last of the Mesozoic. "During the enormous interval of time represented by these massive formations, what is now the axis of the continent remained undisturbed except by a gentle and protracted subsidence. In the great depression thus produced, all the Palæozoic and most of the Mesozoic rocks were accumulated. Then followed the first great upheaval: two lofty ranges of mountains, the Sierra Nevada and the Wahsatch, 400 miles apart, were pushed up from the great subsiding area. These movements were followed by a prolonged subsidence, during which cretaceous sediments accumulated over the Rocky Mountain region to the depth of 9,000 feet or more. Then came another vast uplift, whereby the cretaceous sediments were elevated into the crests of

mountains, and a parallel coast range was formed fronting the Pacific. The Rocky Mountains and the table-land, now permanently raised above the sea, were gradually elevated to their present height. Vast lakes existed among them, in which enormous masses of sediment accumulated. The slopes of the mountains were clothed with an abundant vegetation, in which we may trace the ancestors of many of the living trees in North America. One of the most striking features of the later phases of this history was the outpouring of great floods of basalt and other lavas from many points and fissures. In the Snake River region alone the basalts have a depth of 700 to 1,000 feet, over an area 300 miles in breadth." (Geikie's Geology.)

3. **Minerals.**—*Coal* is usually found wherever the Carboniferous formations of the Palæozoic rocks are found—in the Alleghanies, from northern Pennsylvania to Alabama, though mainly in Pennsylvania; in Nova Scotia and New Brunswick; and in a region extending from Michigan to Missouri or further;—while the Cretaceous formations of the Mesozoic rock furnish the coal in the Rocky Mountain region, both on its eastern flank and within its ranges; in the latter case the coal is chiefly in British Columbia, and in the former mainly in Canadian territory and in Colorado. *Iron* is almost always met with wherever there is rock other than granite; its occurrence with coal in Pennsylvania is of the highest importance commercially. *Gold* is abundant throughout the western plateau, but in the Alleghanies it is found only from Virginia to Alabama; it is also developed locally elsewhere, as in Nova Scotia and Quebec. *Silver* is everywhere in the western plateau, more abundant, perhaps, in the eastern part than in the western; it abounds, too, in the region of the great lakes; a little is met with in the Alleghanies. *Copper* is almost as widely spread as iron; but while few districts are without it, the region of Lake Superior produces it in greatest abundance. *Lead* is also widely distributed, but its principal development is in the region extending from Michigan westward into Missouri. *Tin*, *Mercury*, and *Zinc*, are developed locally, as are also many other valuable minerals. One of the crystalline rocks, called *serpentine*, is everywhere found to be rich in metals of various kinds.

4. **Continental Outline.**—The present shape of a continent is due to the relative directions of its axes. The main axis of North America runs north-west, the secondary axis north-east; the shape of the continent is therefore triangular.

The greatest length, measured along the main axis, is about 4,800 miles; the greatest breadth, along the fifty-second parallel, is about 3,250 miles. The area of the whole continent is estimated at 9,000,000 square miles.

The character of the coast-line also depends upon the mountains; the absence of these in the north and north-east has resulted in an extremely broken coast, with numerous islands, broad channels, and large bodies of almost land-locked water.

This state of things might be caused either by the inroads of the sea on the low-lying land, or by the fact that this part of the continent is only now rising from the ocean. Shells of shell-fish now living in northern seas have been found in the soil of the island of Disco, off Greenland; hence it is thought that northern America is slowly rising.

To a similar cause—the absence of barrier-mountains,—is due the great gap forming the Gulf of Mexico, worn out of the southern part of the continent by the north Equatorial Current.

Where the continental axes give off no side spurs, the coast will be regular. Such is the case in the two American continents. Where, under such conditions, inlets are found, they almost always run parallel to the coast behind narrow peninsulas or islands formed by drift sand or by low hills subsidiary to the axis itself. On the eastern side of America the inlets are mainly of the former character; on the western side they are exclusively of the latter.

Where a mountain range ends inland the country will be very rocky, as is seen in Georgia and Alabama; if at the coast, the outline will be very irregular, and numerous islands will exist. Such a condition is seen at the ending of the main axis of North America in Alaska, and of the secondary axis in Gaspé, the Maritime Provinces of Canada, and in Newfoundland.

5. *Coast-Line*.—Next to Europe, North America has the greatest extent of coast-line in proportion to area; Europe has one mile of coast for every 192 square miles of area; America, one mile for every 288 square miles of area; but a glance at the map of the two continents will show that almost all the irregular coast of Europe is in the highway of commerce, while in North America the irregular coast is in the north and north-east, where, excepting in the Gulf of St. Lawrence, there is no commerce.

6. *Capes*.—In consequence of the lack of mountain spurs projecting into the ocean, North America has but few capes important in the great ocean-traffic. On the eastern side, *Cape Race*, in Newfoundland, is important in the passenger and mail-carrying traffic. Mail steamers

call there and send ashore messages to be forwarded by telegraph to various parts of the continent. *Cape Cod* and *Sandy Hook*, off Boston and New York, respectively, and *Cape Hatteras* in North Carolina—a stormy coast, where the continent takes a sharp turn to the north,—are the only other capes of importance.

Cape Sable in Florida is not approached by vessels, since outside of it lies a long, dangerous coral reef, the “Florida Keys.” Only locally important are the other capes and headlands. The great traffic does not skirt the shore. On the west coast there is no important cape, except *Cape Flattery* at the entrance to the Strait of San Juan de Fuca. *Corrientes* bulges out from Mexico, and *Mendocino* from California, while *St. Lucas* terminates Lower California.

Cape Lisburne in Alaska is said to be the most westerly cape on the mainland, the northern point of Boothia the most northerly, and *Cape Charles* in Labrador the most easterly; while *Cape Columbia* in Grant Land, latitude 83° north, is the most northerly land yet discovered.

7. *Peninsulas*.—There are but three bold peninsulas in North America: one, *Yucatan*, is the only mountain-spur sent off by the main axis of America; *Florida* is a coral reef raised above the ocean,—still rising, it is thought,—and capable of resisting the destructive action of the waves. The peninsula of *Alaska* is simply the long, extended termination of the main axis of the continent. Of the remaining peninsulas of importance, Nova Scotia and Lower California, the first is a subsidiary range of the Appalachians, and the second the prolonged termination of the western Coast Range. Labrador is not properly a peninsula; it is an integral part of the continent.

8. *Isthmuses*.—There are two very important isthmuses—*Tehuantepec*, connecting Central America with Mexico, and dividing the Gulf of Mexico from the Pacific; the *Isthmus of Panama*, only twenty miles across in one place, connecting the two Americas, and separating the Caribbean Sea from the Pacific.

9. *Islands*.—Apart from the West Indies, the islands of North America, excepting those of the Gulf of St. Lawrence on the eastern coast, and Vancouver and Queen Charlotte Islands on the west, are not important commercially or politically; but the number and large size of those at the north of the continent, including Greenland, render them important from a continental, or land-surface, point of view. Though the Arctic climate renders them otherwise useless, they give shape and size to the general northern outline.

Along the whole of the eastern coast, as far north as Newfoundland, there are great numbers of long, narrow islands close to shore, consisting, to the south of the New England States, almost wholly of sand deposited by the coast currents. From the New England States

northward the islands are in the main rocky, though very many, including the dangerous Sable Island off Nova Scotia, are entirely composed of sand. On the western coast islands are almost lacking till Vancouver is reached; thence they form almost one continuous string to the end of the Aleutian Islands, and all of one character—an incomplete mountain chain subsidiary to the main axis.

10. **Coast Waters.**—On the eastern side of the continent the great bodies of water—Baffin Bay, with its continuation into the Atlantic (called Davis Strait), Hudson Bay, Gulf of St. Lawrence, and Gulf of Mexico, are all important as materially modifying the continental outline: besides, the two former are the scene of important whale and seal fisheries. The Gulf of St. Lawrence is also the scene of extensive fisheries, and is on the high-road of Canadian commerce with Europe; the Gulf of Mexico furnishes access to a long stretch of country highly important commercially; while the possibilities of Hudson Bay

are yet in the future,—only in the year 1885 has any serious attempt been made at an exploration. The channels, or straits, by which these communicate with the main ocean, are Belleisle, Florida, and Hudson, respectively. Other inlets of the east are of local importance only, as are also those of the western coast, excepting the Gulf of California,—a gulf 700 miles long, in reality occupying a valley between two of the chains of the continental axis. The inlets and channels of the north are of necessity numerous. They are, for

the most part, imperfectly explored, and are usually filled with ice. Behring Strait, at the narrowest 36 miles wide, connects the Pacific and Arctic oceans, thus dividing Asia from America.

11. **Rivers.**—The characteristic rivers of America are on a grand scale. The nearness of a continental axis to the coast does not permit the existence of large rivers on the coast side of the axis, except where the latter is a plateau and the river traverses it longitudinally. Hence

the rivers on the east and west of North America that run directly to the ocean, are short, while the Colorado and Columbia flow for great distances along the western plateau. But the vast space between the axes, having, in the United States but one central depression, of necessity must give rise to a very large river. Hence the Mississippi and Missouri, with their many large affluents, form a volume of water surpassed in size only by the Amazon. The length, to the source of the Missouri, is about

4,300 miles: the area drained is given as 1,350,000 square miles.

The St. Lawrence, with the great lakes, is situated in a depression along the central swell of the continent, and with a united length of fully 2,200 miles, drains an area of over 600,000 square miles.

The Mackenzie, though unexplored, is evidently, from its situation, a large river, notwithstanding the great quantity of water that is carried into Hudson Bay by the Saskatchewan and Churchill rivers to the south of it.



FIG. 37.—ARCTIC SCENERY.

Though America, both North and South, has not "surrendered itself to the ocean," yet the rivers, from their great size and the level character of the countries they traverse, form vast systems of "natural canals," by means of which almost every part of the continent, however remote from the sea, may be reached by boats. They thus become highways of commerce. The Mississippi, together with its affluents, has, it is said, 35,000 miles of navigable water; the Missouri can be navigated to the base of the Rocky Mountains, nearly 4,000 miles.

12. *Lakes.*—The lakes of North America are very numerous and important, especially in the northern half of the continent, where they form such a connected system of water-way that "a traveller, starting in a canoe from the Gulf of St. Lawrence, can traverse the continent to the Arctic Ocean at the mouth of the Mackenzie; he can reach various points on Hudson Bay; or by the Red River and the Mississippi he can paddle on the waters of the Gulf of Mexico."

The great central plain has few, if any, lakes; but the western plateau has very many throughout its whole extent, the largest being Great Salt Lake; the Alleghanies enclose a number, but they are all small except Lake Champlain.

(See "Canada," sec. 10; also Part I, "Land Surface of the Earth," sec. 30.)

13. *Climate.**—North America stretches from the equatorial climatic zone far into the polar zone, and thus has the sun at every degree of altitude above the horizon; its peculiar physical structure exposes it to the full effects of all the influences that modify climate.

The great central plain, comparatively destitute of trees on its western side, becomes, in summer, greatly heated by a sun almost vertical over its southern portion, and the warm winds thus occasioned pass far to the north, producing a tropical heat even into Canada, and raising the temperature of the southern portion of the plateau ten degrees (90° - 94°) above that of the surrounding country, while a temperate summer-heat of 60° is produced far up into Alaska.

The isotherm of 80° (mean heat of July) in the Pacific approximates to the twentieth parallel; but on touching Lower California it runs directly north over the plateau as far as the Columbia river, then curving north-east it touches Canada and turns south-east, passing below the Great Lakes, and crossing the Atlantic in a general eastern course from Washington, skirts the northern part of the Sahara. The isotherm of 70° runs through the centre of California far up into the great Canadian plain, to about the parallel of 55° , where it curves and runs south-east to the lakes, the course of which, and the St. Lawrence, it follows past Quebec; then bending sharply to the south-west, it enters the Atlantic at about Boston, and, crossing over, runs through the north of Spain. The isotherm of 60° strikes the coast of California near the former isotherm, follows up the coast west of the coast ranges to the north-central part of Alaska, where it bends sharply and follows a south-east course, touching Hudson

Bay and entering the Atlantic across Newfoundland. The isotherm of 50° runs in a direction nearly parallel to the last, at a distance of three or four degrees; while the isotherm of 40° runs almost parallel to 70° north latitude, but bends north in a loop that takes in Baffin Bay.

It will be seen from the preceding that the heat on the land is much greater than that on the water in the same latitudes; also that the belt between the isotherms of 80° and 60° runs diagonally across the continent from the extreme north-west. The cause of the latter phenomenon is found mainly in two facts, viz., the centre of the great plain, in Canada at least, is not in the centre of the continent, but between Hudson Bay and the mountains; and in the second place, the great mass of land, covered with perpetual ice and snow, and the large bodies of cold water, are to the north and north-east, not the north-west; consequently the flow of cold air will be from the north and north-east. Thus the warm winds from the south will be confined more to the west.

Within the tropical zone, near its centre, there are temperatures much higher and also much lower than 80° ; the latter are found on the plateaus of Mexico, the former in the belt of low-lying land around the Gulf of Mexico and Caribbean Sea, and along the low Pacific coast.

In winter, on the other hand, the vast expanse of land becomes correspondingly cooled through excessive radiation; the ocean is now warmer than the land, and the isotherms bend downward from the western coast, and turn to the north-east only when they reach the region influenced by the winds of the Atlantic and other bodies of water.

The isotherm of 80° (mean temperature of January) just touches the south of Central America; 70° lies along the parallel of twenty; 60° along the parallel of twenty-four; 50° crosses the continent in the latitude of the northern part of the Gulf of Mexico; 40° slopes from the Columbia river to Kentucky, and thence crosses to the Atlantic; while 32° falls from Sitka Island to the Atlantic in the latitude of Washington, where it takes a great, sweeping curve to Iceland. North of this all the isotherms show a similar form, all about parallel to that of 32° ; that of 20° crosses the northern part of the peninsula of Ontario, and curves to the north of Nova Scotia.

14. *Moisture.*—It follows, from the preceding, that the heat of the southern portion of the great plain will keep back the cool polar winds, and thus produce a season during which comparatively little rain will fall. From about the thirty-fifth parallel northward, to about the sixtieth, rain is apt to fall at all seasons; in the southern part of this district, however, it is much more copious during spring and fall, in the northern part, during summer. Beyond the sixtieth parallel is the region of summer rain, and in the north, of clouds and mist.

* In studying the climate of a continent or a country, constant reference should be made to Part I., "Climate."

Plateaus within or near the region of a vertical sun always become highly heated up, a circumstance that destroys the effect usually produced upon warm, moist air by elevated land. Hence the Rocky Mountain plateau (including Mexico) has but little moisture; the "Great American Basin," to the north of the Gulf of California (between the Wahsatch and Sierra Nevada Mountains), is rainless in its southern, or "American desert" portion; while other portions of the plateau in the same region have only from nine to twelve inches of rainfall annually. Even the coast of the Pacific has a comparatively small rainfall; at San Francisco the rainfall is but twenty-three inches, much less than at Toronto. Not till Oregon is reached is there at all a copious supply of rain; but from Oregon northward the rainfall is, in many places, excessive, for the plateau is then beyond the influence of a vertical sun.

The high, sloping plain, or plateau, from two hundred to four hundred miles in width, that forms the eastern approach to the Rocky Mountains throughout their whole extent, has also but a slight rainfall; this arises partly from the same cause that produces the dry climate of the mountain plateau, and partly, especially in Canada, from the dry air of the mountains falling upon it.

East of the great central plain the physical conditions are quite different: the Alleghanies run parallel to, not across, the return-trade winds from the Gulf of Mexico; the waters of the north Atlantic are colder than those of the Pacific; these conditions, together with the exposure to the cold north-east winds coming direct from the ocean, produce a copious and almost uniform fall of rain throughout the whole extent, and in the northern part—Nova Scotia, Gulf of St. Lawrence, Newfoundland—give rise also to fogs.

In winter the polar winds, meeting the moist south-westerly return-trade winds from the Gulf of Mexico and the Pacific across the low-lying plateau of Central America, cause a deposition of rain in the extra-tropical regions south of the winter isotherm of 32° . Naturally the heaviest fall will be just to the north of the Gulf—in the neighborhood of New Orleans it is fifty-four inches, where, indeed, as on the southern coast of California, the seasons approach the tropical in character. (See Part I., "Atmosphere," sec. 30.) North of the winter isotherm of 32° , the rain will be turned into snow; wherever in the great plain the rainfall of summer is light, the snowfall of winter will be light, and wherever the rainfall of

summer is copious the snowfall of winter will be copious. Thus, in the region of the great lakes, the snowfall is greater than in the plains to the west. At Toronto the average annual rainfall is 28 inches, the snowfall 69 inches (in 1884 it was 84 inches); at Winnipeg the average is 17 inches of rain and 53 of snow. All along the northern Alleghany region, except on the immediate coast, the snowfall, like the rainfall, approaches the excessive. The plateau east of the Rocky Mountains has but a light snowfall, even where, north of the Columbia, on the mountain plateau there is an excessive one, the causes being the same as those that produce the dry climate. The winters of these dry regions are clear and cold; those of moister regions have a more cloudy sky, while an equal degree of cold is more keenly felt.

The southern part of the continent (Mexico and Central America) has a tropical climate—the retreat of the sun being followed by a period of almost continual rain, the fall in the low-lying coast being excessive, at Vera Cruz reaching 183 inches; the central plateau being quite low in the southern part, shares in the tropical climate, the southern portion of Central America lying in the region of almost daily showers.



FIG. 38.—THE PINE-APPLE

15. **Vegetation.***—The range of vegetation in North America is like that of climate—from tropical to polar. The vegetation of the tropical districts, Central America, the coasts of Mexico, and those parts of the United

* See "Vegetable Life," Part I.

States bordering on the Gulf of Mexico, comprises indigo, dyewoods, medicinal plants, bananas, coffee, cotton, sugarcane, rice, oranges, pine-apples, and other fruits.

The fertile lands beyond this tropical, or sub-tropical, region, and on the Mexican plateau, produce the various food grains and fruits. Wheat has a range as far north as Sitka on the west and Gaspé on the east; Indian corn is distributed equally widely, but is best developed midway between extremes; barley, rye, and oats are confined to the more northern portion of the area; peaches, melons, and the grape reach their highest degree of perfection in the central region, while apples, pears,



FIG 39.—THE BANANA

and plums are finest farther north. Potatoes require a cool climate, and hence are found in their perfection only on the highest part of the plateau of Mexico, and north of the fortieth parallel.

Forest growth is found everywhere except in the dry regions; the hundredth meridian approximately indicates the boundary between the treeless regions and those containing more or less of forest growth. North of the fifty-fifth parallel, forest growth is everywhere found till the polar region of mosses is reached. The mountain

ranges are also clothed with forest, and so too are the plateau of Mexico and the plateaus outside the "great American Basin." The forests of the low coasts of Mexico, as well as those throughout almost the whole of Central America, are characteristic of all moist tropical regions,—dense and luxuriant.

The treeless plains are not barren, but are covered with grass, that even in the driest part of the year does not wholly disappear. On the otherwise barren districts of the plateaus, the sage bush, and some stunted, prickly shrubs and plants of the cactus family are met with.

16. Animals.*—The vast grassy plains of North America are peculiarly adapted for the maintenance of herbivorous animals in countless numbers. The bison and the antelope roamed the prairies from Texas to far up into Canada, but have now given place to the beesves of the "ranches." Deer of various kinds, including the moose and cariboo of Canadian forests, abounded till thinned off by the settlement of the country. The disappearance of these is followed by the disappearance of carnivorous animals that prey upon them—wolves, coyotes (or *prairie wolves*), bears, panthers (often called the *puma*, or *American lion*), and others. Very numerous, and widely distributed, too, are the rodentia (that is, the *gnawing animals*), giving rise to an important industry—hunting and trapping; such animals are the beaver, the mink, and the musk-rat.

Confined to a narrower range are the sable, marten, otter, and the Arctic fox, highly prized for their fur; the white bear and the small, shaggy musk-ox of the Arctic regions—the latter animal being but little known; the grizzly bear and the big horn, or Rocky Mountain sheep, of the Rocky Mountain region; the peccary, a small, fierce animal of the hog kind, in the south-western United States; and a few monkeys in the extreme south.

Of reptiles, the serpents are most widely distributed. Of the venomous kind, mostly confined to the warmer parts of the continent, the rattlesnake is the most widespread, some being found even in western Ontario. Very few serpents are found in the sub-arctic zone, and none at all in the arctic and polar zones. Nowhere in North America do they reach the formidable size that they attain in the tropical regions of South America, Africa, and southern Asia. The other chief reptiles, the turtle and the alligator, belong to the tropical part of the continent.

* See "Animal Life," Part I.

Of birds, the water-fowl are exceedingly numerous. They migrate in countless numbers in the spring, northward to the lakes and seas of northern America, and in the fall to the bays, inlets, and lakes of the middle and southern United States. Of song-birds, North America possesses few as compared with Europe, but the mocking-bird of the Southern States is unsurpassed in power of voice and range of note.

As most of our northern birds—pigeons, swallows, sparrows, finches, thrushes—migrate southward during winter, hawks and other birds of prey follow them. Crows, buntings, pheasants and some others do not migrate. Our most powerful bird, the eagle, is found over a wide extent of the continent, while the wild turkey, a native of America, has an equally wide range. Parrots are found only in the tropical regions.

Of the marine animals, other than fish, the seal is the most important; and though its range is along the shores of the whole continent, the chief hunting-grounds are north of Newfoundland and north of Vancouver Island. From the blubber, oil is obtained, and the skin is used in various ways. Next in importance is the whale; like the seal, its range is throughout the extent of the ocean, but the principal fisheries are in the bays and seas of the north of both oceans. The walrus is valuable mainly for the ivory that its tusks supply; it is hunted but little. The sea-otter furnishes a very valuable fur. (See, for food-fishes, etc., Part I., "Marine Animals.")

17. Industries.—As climate, physical conformation, and geological structure determine the productions of a country, so the productions determine the occupations of the inhabitants.

The great plains of the centre of the continent and of the east coast, extending through every variety of climate, determine the leading pursuit of the people of North America to be *agriculture* in all its forms—stock-raising and cultivation of useful plants, from cotton and medicinal plants to barley and oats. The huge mass of mountains containing metalliferous rocks points to mining as another important industry; and the motive power furnished by great beds of coal, often in close proximity to iron, and by numerous rapid streams, show that manufacturing will also be an important industry.

Natural facilities for manufacture, together with an extensive sea-coast and a ready means of communication with the interior through great rivers and lakes, indicate a commercial country. These advantages for commerce are enhanced by the existence, along a large part of the coast, of extensive submarine plateaus of the highest importance for fisheries. The oceanic fisheries, beside affording vast quantities of food, also train



FIG. 40.—HARVEST SCENE ON THE AMERICAN PLAINS.

men to the sea, and thus furnish a supply for the mercantile navy.

It may be seen, from the map, that all the great river basins directly or indirectly turn eastward, while a great barrier shuts them off from the west, a fact that directs American commerce towards Europe.

POLITICAL DIVISIONS.

Politically North America is divided into the following countries:—

Dominion of Canada (with Newfoundland, forming *British America*); United States (including Alaska); Mexico; various independent states comprised under the term Central America; Greenland; the Bermudas, and West India Islands—belonging, with one exception, to different European nations.







FIG. 41.—PARLIAMENT BUILDINGS, OTTAWA.

THE DOMINION OF CANADA.

1. The Dominion of Canada, with an area estimated at 3,470,257 square miles, occupies all of the northern portion of the continent except Alaska. Its greatest length, measured along the fifty-second parallel, is given as 3,200 miles, and its greatest breadth, measured from Point Pelee, in Lake Erie, directly north to the extremity of Melville Peninsula, is somewhat over 1,900. But the part of value as the abode of man has a breadth not greater than five hundred miles.

The southern boundary of the Dominion extends through Juan de Fuca Strait and Gulf of Georgia to the parallel of 49° north; thence along that parallel to the Lake of the Woods; here it turns directly north for about twenty-five miles, and again turns south-east, following the Rainy and Pigeon rivers to Lake Superior; from this point it follows the chain of lakes and the St. Lawrence to the forty-fifth parallel, and runs along that parallel to the Green Mountains; these it traverses for a distance, and then, leaving them, runs an irregular north-east course to the little river St. Francis, in about lat. 47½°; this it follows south-east to the St. John river; thence along this river to a little beyond the sixty-eighth meridian, where it turns directly south to the St. Croix, which it follows down to Passamaquoddy Bay.

In the west, Alaska begins at the Dixon Entrance north of Queen Charlotte Island; after passing up to the head of Portland Canal, the boundary follows the crest of the coast range to the hundred and forty-first meridian; this meridian then forms the remainder of the western boundary. Elsewhere the boundary is the ocean.

PHYSICAL FEATURES.

2. The general physical features of Canada, as a part of North America, have already been given—in Part I, "Land Surface of the Earth," sec. 19, and elsewhere. But beyond the bounds of the older provinces, in the east, and north of the parallel of 56° or 57° in the west, very little is accurately known. South of this the country has been explored to a considerable extent by government surveyor and other competent persons. Maps and charts not prepared from the reports of these have but little value.

3. **Geological Structure; the Laurentian Plateau.**
The most remarkable feature in the structure of Canada, perhaps of America, is the great extent and peculiar form of the Laurentian strata. A band of crystalline rock, the first formed part of the continent, giving shape and character to the whole, and varying from three hundred to seven hundred miles in breadth, starts with Labrador, and, in a roughly circular form, sweeps round Hudson Bay and passes off to an unknown distance northward, thus forming the largest part of the land surface of north-eastern America. The outer rim of this circle is marked by an almost uninterrupted chain of river and lake—the St. Lawrence and the great lakes,

the waters connecting Lake Superior and Winnipeg, the Churchill River lakes, and Lake Athabasca and Great Slave Lake beyond.

The plateau varies somewhat in height, but excepting the Laurentide Hills, it hardly ever exceeds a thousand feet above sea-level; Lake Abittibi, south of James Bay, on the crest of the plateau, is about nine hundred. It is, upon the whole, level or undulating, with its highest elevation nearer the outer than the inner rim; but, on approaching the rims, the descent is almost always quite steep, giving rise to rapids and waterfalls on every stream—the innumerable “portages” of the Canadian “voyageurs.” The inner rim of the circle does not always reach the water of Hudson Bay; on the south and west, non-crystalline formations (Cambrian and Devonian) extend inland, in some places, two hundred miles. These districts are bounded landward by a distinct rim of hard ancient rocks that have a steep slope to the centre all round. They are low, level, swampy, and, as far as known, generally free from lakes. The Laurentian plateau on the other hand abounds in lakes throughout its whole extent.

West of Quebec city the Laurentian rocks do not quite reach the St. Lawrence; a narrow band of the same kind of rocks as those that skirt the shore of Hudson Bay (Palæozoic), runs the whole length of the river as far as the Thousand Isles. There a narrow isthmus of Laurentian crosses the river, enters New York State, and expands into the Adirondack Mountains, forming a complete inland peninsula. West of this point none of the Ontario peninsula is Laurentian. Associated throughout the whole extent of the Laurentian, as far as is known, are great areas of other crystalline rock (called *Huronian*, from being largely developed north of Lake Huron); also, here and there, as in Montcalm county north of Montreal, up the Saguenay, and between Lake Huron and James Bay, areas of volcanic, or trap rock are found, and north and west of Lake Superior granite is met with.

From the Lake of the Woods, a belt, similar in character to that along the St. Lawrence, skirts the Laurentian on its western boundary; west of this, and extending to the base of the Rocky Mountains, is a totally different geological formation (the *Cretaceous*, of the Mesozoic age. See Diagram, Fig. 2). The same appears again in the Rocky Mountains, and beyond in Vancouver and Queen Charlotte Islands. This is the most extensively developed formation in western North America.

In none of the formations referred to above does the solid rock appear at the surface; only in the channels eroded by rivers, at waterfalls, rapids, and in hills, is the solid rock visible. (See Part I., “Building up of the Earth,” sec. 10.)

4. Surface Characteristics.—It will have been seen that the Rocky Mountain plateau, the Laurentian plateau, and the Alleghany system, determine nearly the whole of the surface of Canada. The first has its highest part at the eastern side, and consequently slopes to the Pacific. Between that plateau and the Laurentian lies the great depression whose waters are carried off north the great depression whose waters are carried off north by the Mackenzie, while, to the east, the St. Lawrence and the northern from the Alleghanies. The great depression of Hudson Bay receives all the water from the inner slope of the Laurentian plateau, and also from the peculiar depression lying between the parallels of 49° and 55°, which is drained by the Churchill, the Saskatchewan, Assiniboine, and their affluents.

Nowhere, except in the western plateau and in the Alleghany region, is the Dominion elevated. New Brunswick may be termed hilly rather than elevated, and Nova Scotia undulating; the Laurentian area is rugged and rough, but not high; the great plain of the west has differences in altitude, and is everywhere marked by inequalities of surface characteristic of all plains.

5. Minerals.—In only two of the Provinces of the Dominion, Nova Scotia and British Columbia, have the mineral resources received special attention, and in these only gold and coal have been sought for. Narrow strips along the great lakes and the St. Lawrence have been partly explored, but all beyond has been neglected. Within the last few years government surveyors, especially of the geological corps, have been busy in the North-west, and have shown that region to be rich in minerals.

Iron seems to be widely distributed over Canada, especially in the Laurentian and allied rocks; but only in the older Provinces, particularly Ontario, Quebec, and Nova Scotia, has it been mined to any extent. The absence of coal in the first two Provinces has been a great hindrance to the development of the iron-producing industry.

Coal is most abundant at the extremes of the Dominion—Nova Scotia and British Columbia; but a species of coal, called *lignite*, valuable as a fuel, but inferior to the anthracite and bituminous varieties, is found in practically inexhaustible quantities in the whole of the region

between Turtle Mountain (in southern Manitoba) and the Rocky Mountains.

"The district of the North-west Territory, which, so far as yet known, affords the most abundant and valuable deposits of mineral fuel, is that in proximity to the Bow and Belly rivers and their tributaries, extending eastward from the base of the mountains to about the 111th meridian . . . It is quite possible that the country holding the same relation to the base of the Rocky Mountains farther north, may yet prove throughout equally valuable as a source of fuel."*

Beside the lignite, valuable deposits of bituminous coal are found along the base and within the ranges of the Rocky Mountains, and in some places the still more valuable anthracite coal occurs, as it also does in Queen Charlotte Islands.†

Lignite has also been found near James Bay.

Gold.—Like coal, gold is found most abundantly in British Columbia and Nova Scotia, but in by far the greatest quantity in the former. It is also found to some extent in Ontario, both to the north of Lake Ontario and north and west of Lake Superior; at the Lake of the Woods; and in Quebec.

Silver is not found in large quantities in the Dominion. The richest mines are in Ontario, north of Lake Superior and Lake Huron; Quebec also furnishes some.

Copper has been mined chiefly in Quebec and Nova Scotia, but it exists in large quantities in the region of the upper lakes, and apparently, also, in the Rocky Mountain plateau. In New Brunswick it has been long known to exist over a wide space of country.

Gypsum has been largely mined in Nova Scotia, and to some extent in New Brunswick and Ontario; but it is met with quite widely, in the region of James Bay, in the North-west, and elsewhere.

Limestone is also spread over the whole Dominion, but in quite different geological formations.

Other important economic minerals, such as apatite and manganese, are but locally developed as far as known.

6. Coast Outline.—The striking feature in the coast outline of Canada is its extreme irregularity. Had the

* From "Notes on the Coals and Lignites of the Canadian North-west," by G. M. Dawson, Assistant Director Geological Survey (1884).

† "The coals and lignites of the North-west Territory and British Columbia are entirely of the Cretaceous and Tertiary age . . . The fuels of the Eastern Provinces and States and of Great Britain, are included in the Carboniferous system."

country thus indented a more genial climate the commercial advantages of the irregular coast would be of the utmost importance. As it is, only the Gulf of St. Lawrence, the Bay of Fundy, and the tortuous inlets of British Columbia, afford means of maritime intercourse. The value of Hudson Bay is yet to be tested.

Peninsulas are not numerous in Canada, nor are they important, except in the case of Nova Scotia, which is important both on account of its being a Province of the Dominion, and of its being in the path of the great oceanic traffic. The isthmus of Chignecto joins it to New Brunswick. Boothia (containing the magnetic pole of the earth) and Melville peninsulas, are barren projections of land in the north.

Gaspé peninsula, the south-eastern extremity of Quebec, lying between the St. Lawrence and Bay Chaleur, is hardly to be distinguished from the mainland.

7. Islands.—Excepting Newfoundland and Long Island, all the important islands of North America proper belong to the Dominion; one, *Prince Edward Island*, forms a province by itself; two, *Vancouver* and *Cape Breton*, are integral parts of provinces.

Anticosti and the *Magdalen Islands* in the Gulf of St. Lawrence, and Grand Manan at the mouth of the Bay of Fundy, are of great importance for their fisheries.

Sable Island, off in the Atlantic, eighty-five miles east of Nova Scotia, is a semi-circular island of loose gray sand. It is twenty-two miles long and about one broad; but with its shoals and bars it is over fifty miles long. It lies so low in the water that vessels are often within a few miles of it without being aware of its presence. "In bad weather it is a continuous line of over fifty miles of foaming breakers, producing a most terrific effect, the island seeming to shake to its foundation as the whole body of the Atlantic breaks upon it." As this dangerous island, sometimes called the "graveyard of America," is directly in the track of Atlantic travel, the Government maintains upon it a superintendent and eighteen men, whose duty it is to be constantly on the lookout to rescue the crews of wrecked vessels. Only these government officials are permitted to live on the island.

The islands of the Arctic regions, though often large, are barren and unimportant.

8. Coast Waters.—Like the islands of the same region, the coast waters of the north are many and large, but practically of no commercial or political importance; Hudson Bay, the Gulf of St. Lawrence, and the Bay of Fundy, on the east, are important in every respect; the coast waters of British Columbia are of mere local importance.

Hudson Bay, having an outlet 400 miles long through Hudson Strait, has hitherto been frequented only by the few annual ships of the Hudson Bay Company, or

by whaling vessels. In consequence, its character and resources are yet practically unknown.

It is possible that this bay may yet become the channel through which much of the trade between the North-west and England will be carried on. Hudson Bay is very large: including its southern prolongation, James Bay, it measures about 1,000 miles in length, and more than 600 miles in width in its northern part. "Its total area is in the neighborhood of 500,000 square miles, or upwards of half that of the Mediterranean."

James Bay "is so shallow that a person may frequently touch the bottom with an oar, when almost out of sight of the low shore in a boat." Owing to the large amount of fresh water flowing into it, its waters are only brackish, or even fresh in some places.

The *Gulf of St. Lawrence*, forming the wide entrance into the St. Lawrence river, gives a peculiar broken character to the eastern extremity of America. It is of great importance for its fisheries. The value of the fish taken in 1883 by Canadians living on the Gulf coast in the various provinces, was nearly \$6,000,000, beside the herring of the shallow waters around the Magdalen islands. The cod and similar fish are caught in the cold polar waters of the Gulf during the whole of spring, summer, and fall.

Icebergs are carried into the Gulf through the Straits of Belleisle by the Labrador polar current that sets down through this strait. The shallow waters at the south, around Prince Edward Island, become warm in summer; but elsewhere only a surface layer, sometimes not more than a foot thick, is warm, while all below is very cold. Violent storms, especially from the east, are frequent in the Gulf; the high and rapidly converging character of the land of the western and northern shores forces the easterly winds into a narrower space, thus increasing their violence.

The egress northward is through the Strait of Belleisle, past Cape Bauld in Newfoundland; the southern egress is between Cape Ray of Newfoundland, and Cape George of Cape Breton Island. In spring and summer icebergs are encountered much more frequently by the northern passage than by the southern.

The *Bay of Fundy*, over a hundred miles long, and sixty at its greatest breadth, lies between the cliffs of Nova Scotia and New Brunswick, opening up a water way to the most productive parts of both provinces. Its fisheries are very valuable, especially in the spring and early summer, before the rising temperature of the water forces the fish seaward. (See Part I., "Ocean," sec. 15, for other reference to Bay of Fundy.)

9. **Rivers.**—The rivers of Canada, excepting the great ones already referred to, though numerous, are for the most part short, and only locally important as means of internal communication. Except in the lower courses of the larger of these streams, navigation for vessels, other than mere boats, is impossible; but in the eastern half of the Dominion, where they flow from a wooded region, they furnish ready means for the conveyance of timber to tide-water; and the innumerable rapids and falls with which their course is marked, afford an unlimited supply of motive power. The most important of these secondary rivers are the St. John and the Ottawa, in the east,—neither of which can be navigated continuously more than a hundred miles,—and the Fraser, in the west.

10. **Lakes.**—The lakes of Canada have already been referred to. They form the most remarkable chain in the world, encircling, as they do, the whole of the vast "Laurentian continent," from the Arctic ocean almost to the Atlantic, and present a water surface in the interior of the continent of probably not less than 150,000 square miles. What the resources and capabilities of Lake Winnipeg, and those to the north of it, may be, has yet to be determined; but the five lower lakes, in addition to having a considerable effect upon the climate in their neighbourhood, afford means for very extensive inland intercourse, and are exceedingly valuable for their fisheries.

The following table shows the maximum measurements of the lakes; but the estimates, especially regarding their depth, vary materially:—

LAKES.	Length, in Miles.	Breadth, in Miles.	Depth, in Feet.	Height above Sea-level, in Feet.
Superior.....	400	160	1,200	602
Huron.....	280	105	1,800	582
Michigan.....	335	88	1,000	600
Erie.....	240	58	270	574
Ontario.....	190	55	600	247

The northern part of Lake Superior has several bays and harbors—*Nipigon Bay*, *Black Bay*, *Thunder Bay*—formed by projections of the land or by islands. At the extremity of the peninsula forming Thunder Bay stands *Thunder Cape*, a bold, stormy promontory 2,000 feet high. At some distance to the south lies *Isle Royale* (belonging to the United States) the largest island in the lake. Near the eastern end is the island of *Michipicoten*, with a bay of the same name, to the east.

The shores of the lakes wherever they are formed by the Laurentian or Huronian rocks, are steep, rugged, and often picturesque. On the southern shore, in Schoolcraft County, Michigan, occur the famous *Pictured Rocks*, cliffs of variegated sandstone, worn into fantastic shapes by the action of water.

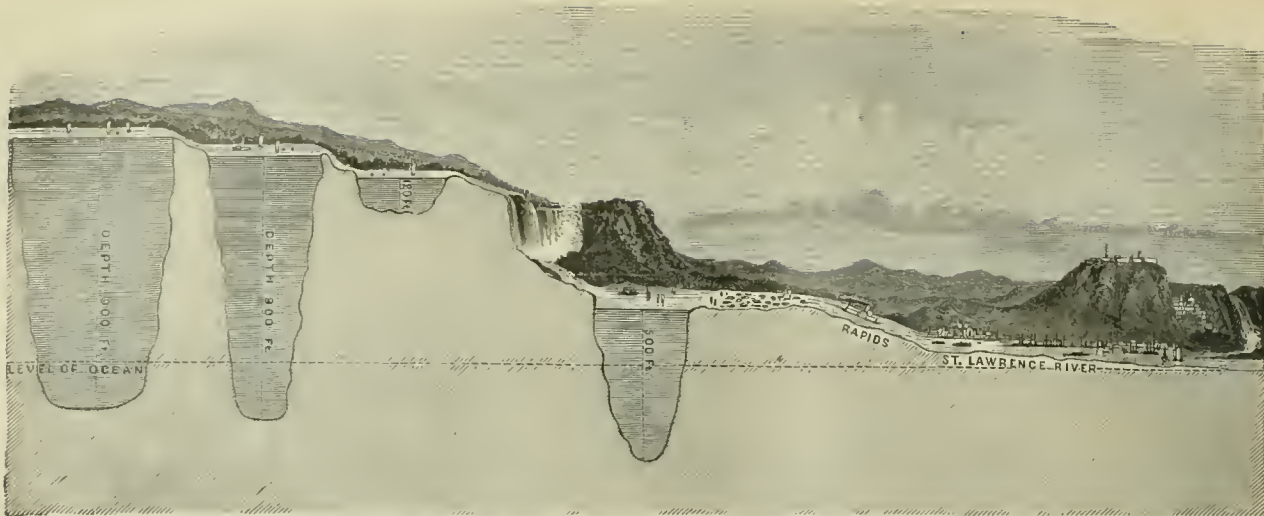


FIG. 42.—THE GREAT LAKES AND THE ST. LAWRENCE TO THE FALLS OF MONTMORENCI, ELEVATION ABOVE SEA-LEVEL, DEPTH OF LAKES, ETC. The vertical scale is very many times greater than the horizontal, consequently the rapidity of descent from lake to lake, and of the bottom of the lakes, is greatly exaggerated.

Through *Whitefish Bay* and the *St. Marie (St. Mary)* river the water of Superior passes into Huron. The rapid of *Sault Ste. Marie** occurs on this river; boats overcome it by means of a canal on the United States side of the rapid.

In the northern part of Lake Huron lies the large island of *Grand Manitoulin*, with *Cockburn*, *Drummond* (belonging to the United States), and *St. Joseph* islands, and some smaller ones at the west. These shut off the *North Channel* from the rest of the lake on the north, and, with the *Bruce Peninsula*, the *Georgian* and *Nottawasaga* bays on the east. *Grand Manitoulin* is eighty miles long and twenty broad; it is well wooded, rugged, and quite elevated.

Through the *St. Clair River* and *Lake* and the *Detroit River*, the water passes on to Lake Erie. Lake St. Clair is almost filled up with sediment. It is a lagoon rather than a lake, and wide marshes border it nearly everywhere.

The outline of Lake Erie is singularly regular, being broken only by the narrow projections of *Point Pelee*, *Point aux Pins*, and *Long Point*, with the "bays" or harbors of *Pigeon Bay*, *Rondan Harbor*, and *Long Point Bay*, enclosed by each respectively. The only islands of any consequence in the lake are *Point Pelee Island*, off the point of the same name, and *Long Point Island*.

"The comparatively shallow waters of Lake Erie foreshadow the time when this lake will become a broad river valley, and the cataract of Niagara will then either be reduced to half its present height, or entirely obliterated."

The *Niagara River* carries the water of the other lakes into Lake Ontario. Like that of Lake Erie, the outline of Lake Ontario is quite regular, except at its north-eastern side. There the fantastically shaped peninsula of *Prince Edward County*, having a very narrow isthmus, shuts off from the lake the equally fantastically shaped *Bay of Quinte*†, a very long, shallow inlet. *Point Peter* is the extremity of the peninsula. In its neighborhood are extensive shallows, and as squalls are apt to occur there, navigation is not very safe.

From this point to the end of the lake there are many low, sandy islands, besides others that are rocky.

The wide extent of water-surface afforded by the lakes produces during summer, on account of the great evapo-

ration, an area of low pressure, which, in a region of variable winds, often produces sudden storms, or squalls; indeed, the storms and waves of Lake Superior are said to equal those of the Atlantic; and, for the same reason, —the sudden condensation of vapor,—the fogs of all the lakes, but especially of Superior, are quite dense and frequent.

11. Climate.—The inhabitable part of Canada stretches east and west, and, if the physical conditions affecting climate were the same throughout, the same climate would prevail throughout. But the western plateau region has a climatic character of its own, affecting likewise that of its eastern flank. The prairie region has another, that of the Hudson Bay and the great lakes another, and that of the eastern coast still another.

The whole of Canada excepting the western coast, has an excessive climate, as has already been explained. The physical conditions that tend to produce an excess of heat in summer, tend to produce an excess of cold in winter. This excessive climate exists in the western plains to a greater degree than in the eastern part of the Dominion, where the ocean and the great lakes exercise a more or less moderating influence.

The moisture throughout the eastern part of the Dominion is, as has been shown, sufficiently abundant and well distributed. The western plains, in the neigh-

* *Sō Sante Marei*; the pronunciation *soo* is merely local.

† The old pronunciation *Can'tā* is fast disappearing, *Quin'té* taking its place.

borhood of the mountains especially, are like the plains farther south, dry. They have little rain in summer and little snow in winter.

12. **Vegetation.**—The population of Canada has, till within the last few years, been confined to its most southern parts. In these the natural capabilities and productions of the soil are well known. The lands to the north and west are just being opened up, and time will be required to determine their capabilities.

East of the great lakes *wheat* is profitably raised as far north as the forty-ninth parallel. To the west the range is higher, reaching, possibly, in the neighborhood of the mountains, the fifty-fifth parallel, though in this latter region the crop is in constant danger of injury from early frosts. (See "North America," sec. 13,—*"Isotherms."*)

Indian corn, though grown to some extent over a wide area, is regarded more as a garden vegetable than as a farm product, excepting in southern Ontario, where it can be profitably raised as a crop.

Rye, barley, and oats are hardy, and can be grown farther north than wheat or Indian corn.

Of orchard fruits, *apples* and *pears* do not seem to grow well, except in Nova Scotia, western Quebec, and Ontario. *Plums* and *cherries* grow more widely; while *peaches* and *grapes*, especially the former, are confined to the lake districts of southern Ontario and to western British Columbia.

Forests are spread over the whole Dominion east of Lake Manitoba—that is, in the region of abundant moisture. Westward of this lake, south of the North Saskatchewan, trees occur in small groves as far as the 110th meridian; from this point to the foot hills of the mountains the country is treeless, except in some river courses. North of the North Saskatchewan, where the moisture is greater, forest growth extends almost to the Arctic regions. The mountain region is covered with forest.

As Canada is, in the main, in the cold temperate zone, the characteristic forest trees are of the pine family. In the southern portion *white pine* is predominant, but in the Maritime Provinces and Labrador, eastern Quebec, and the north generally, *spruce* and *fir* (balsam) prevail. *Maple, elm, beech, and hemlock* are widespread; *poplar* and *birch* are found over the whole Dominion, even to the Arctic regions.

Comparatively few trees are local. The famous *Douglas pine* is found only on the western plateau and the shores of the Pacific. *Chestnut, butternut, walnut, and oak* are confined, in the main, to the southern part of the western peninsula of Ontario. *Hickory, basswood, and buttonwood*, though more widely distributed than the preceding, are found chiefly in southern Ontario. *Cedar* and *tamarack* (larch) occur in almost all damp districts of the Dominion.

13. **Animals.**—These have been referred to under "North America," sec. 16.

14. **Industries.**—The industries of Canada, in so far as important commerce, either internal or external, is concerned, have hitherto been those of all new countries,—the procuring and disposing of those crude or direct natural productions that individual strength and resources can deal with most readily. Hence lumbering, agriculture, and fishing have been the only industries of importance. But with the increase of population, and the increase of wealth, these resources of the country are becoming more fully developed than ever; and the growing wants of the country, along with increasing facilities of intercommunication, are leading not only to other industries, such as mining, that can be carried out only by wealth and combined effort, but to those also that have for their object the preparation of the crude products of nature for immediate use,—in other words, manufacturing.

15. **Agriculture**, the great source of the supply of food in its different forms, will always be the leading industry of Canada. The vast treeless western plains, the valleys of British Columbia, and the plains of Ontario, Quebec, and the Maritime Provinces, which are being rapidly deprived of the forests that still remain, are all, more or less, adapted for cultivation or for pasture. And as agriculture is more and more becoming a science, better and better results are being obtained without danger of exhausting the soil. (See Appendix I. (a).)

16. **Fisheries.**—The other great food-producing industry is the fisheries. It is carried on in the oceanic waters of both sides of the Dominion, and in the inland waters as well.

Fisheries and agriculture are inexhaustible sources of wealth, if conducted intelligently. Mines may give out without possibility of renewal; forests may be destroyed,

but their restoration, if possible, must be the work of more than one generation, and must form, practically, a part of agriculture. Agriculture is fast becoming a science; fishery shows little or no progress towards becoming such;—little or nothing is known of the habits or conditions of life of the great food-fishes. Human intelligence and skill are employed, with slight exception, in destroying marine life, and not in seeking, while “reaping the harvest of the sea,” to perpetuate and increase its productiveness. (Appendix I. (c).)

17. **The Forest.**—By consulting Appendix I. (d), it will be seen that the forest industry, next to agriculture, is the greatest of the Dominion. In the Maritime Provinces, and in southern Quebec and Ontario, the best timber is already gone; and though some farmers still own a grove of pine trees, yet everything like a forest has disappeared. Only in the back country do forests now exist, and capitalists or wealthy companies alone carry on this industry, in which, not many years ago, every farmer was more or less engaged.

18. **The Mine.**—The mineral wealth of Canada has yet to be developed. Very little systematic effort has hitherto been put forth in mining. The causes of this have been, in part, referred to; others are, distance from market, the hostile tariffs of other countries producing the same minerals, or the greater natural facilities possessed by those countries for mining, manufacturing, and exporting the same minerals. Gold and coal constitute two-thirds of the value of the mineral exports of Canada. (See Appendix I. (e).)

The inter-provincial trade in mineral products is confined to coal, salt, coal-oil, and iron. Coal goes from Nova Scotia to New Brunswick, Prince Edward Island, and Quebec,—little to Ontario. Salt and coal-oil are sent in but limited quantities from Ontario to the Maritime Provinces; and iron, but to a limited extent, from Nova Scotia and Quebec to the other provinces.

19. **Manufactures.**—An essential element in successful manufacture is cheapness of production, the existence

of a market being implied; and cheapness of production depends mainly upon a combination of physical conditions,—materials for manufacture, motive power (running water or coal) within a convenient distance, and natural facilities for distribution. The unequalled facilities for distribution, and the abundance of coal and iron possessed by England, enable her to import raw material of every kind from all quarters of the earth, manufacture it, and then distribute it at a lower price than can other nations, equally intelligent and skilful, but physically less favorably situated.

A little examination will show that Canada possesses these physical conditions only in a moderate degree. But the natural facilities possessed, and the existence of a rapidly increasing home-market, cannot fail to maintain in Canada important manufactures, at least of those raw materials that the country produces.

As yet, apart from flour and lumber, Canada's manufactured exports may be, in the main, regarded as the surplus

after the home-market has been supplied; and though the total amount of these exports is considerable, yet, except in the case of two or three, no large quantity of any one article has been sent abroad. (See Appendix I. (f).)

20. **Commerce of the Dominion.**—The products of the Dominion are numerous, and are capable of large increase, except those of the forest. The exportation of these products, and the importation of goods from other countries, constitute Canadian commerce. Canada imports various articles of food and luxury not produced in our climate—sugar, tea, rice, fruits, wine, etc.; manufactured articles, either those that are not made here or that are required to supplement such as are made—fabrics for clothing, ornaments, jewellery, etc.; materials for manufacture or use in manufacture—cotton, wool, tobacco, etc. The trade with Great Britain and the United States is about equal—nearly ninety per cent.



FIG. 43.—LUMBERING SCENE.

of the whole; that with the West Indies and Newfoundland is next in importance. (See Appendix I. (g).)

Among maritime countries Canada holds the fourth place at least, only Great Britain, the United States, and perhaps France, owning more tonnage in vessels.

A very large number of the vessels owned in the Maritime Provinces are engaged in what is termed "the carrying trade," that is, in carrying goods from one foreign country to another. "Coasting trade," however, that is, the carrying of goods from one foreign port to another in the same country, is not open to them, at least in the United States. These vessels are manned almost exclusively from the Maritime Provinces, and thus a very large portion of the people, especially of Nova Scotia, follow a sea-faring life.

21. Revenue of the Dominion.—The revenue of the Dominion is derived from the sale of public lands, from licenses of various kinds, from duties imposed on imports, and from excise duties, or taxes upon certain manufactures. (See Appendix I. (h).)

22. Commercial Routes.—The commercial routes of an inter-provincial character are formed, in the first place, by the large rivers and lakes with the canals associated, and by the oceanic waters; secondly, by the railways. (See maps.) The latter connect with the great railways of the United States that lead to the ocean.

The Canadian Pacific Railroad is transcontinental, extending from a temporary terminus at Montreal to the Pacific at Coal Harbor, on Queen Charlotte Strait. The Grand Trunk (and Great Western) conveys freight and passengers to and from the United States at Sarnia, Windsor, and Niagara; and to and from the ocean at Portland (Maine), summer and winter, and at Quebec in summer; while the Intercolonial, connecting with the Grand Trunk at Quebec, terminates from Moncton, N.B., by one branch, at St. John, and by another, at Halifax,—these two cities being the chief winter ports in the eastern Dominion. Both of the two great roads have very many side branches that act as feeders to the main lines, those of the Grand Trunk being especially numerous. The number of miles of railway in Canada may be reckoned at about 12,000.

Canadian goods also reach the ocean at Boston and at New York by railroads through New York State.

The traffic on the lakes, especially on the two lower ones, is for the most part with the United States.

23. Political Divisions.—These are the provinces Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Manitoba, and British Columbia; the districts Keewatin, Assiniboia, Alberta, Saskatchewan, and Athabasca; the North-West Territory, and the North-East Territory (the western part of Labrador).

These constitute a Federation known as the *Dominion of Canada*. The capital is Ottawa, in Ontario.

24. Government.—By the British North America Act of 1867, each province has the control of its own purely local concerns, the federal government dealing with all matters of an inter-provincial character—postage, coinage, commerce, fisheries, criminal laws,—and exercising a supervision over the Acts of the legislatures of the various provinces.

But as Canada is an integral part of the British Empire, the controlling power in which is the government of Great Britain and Ireland, the Acts of the Canadian Government are subject to the supervision of the Home Government, it being understood, however, that nothing that concerns Canada alone shall be disallowed, except the making of treaties with foreign countries, and the violation of any of the terms of the British North America Act,—the whole spirit of the relationship of the mother country to the colonies being the concession of the utmost freedom of action compatible with the maintenance of the Imperial authority.

No revenue whatever is derived from Canada by the Imperial Government. Canada is practically independent; the bonds that unite us to the mother land being those that at all times, and in every country, have most strongly influenced men of high character,—tradition and affection.

The Home Government appoints the Governor-General; the Dominion Government, the Lieutenant-Governors of the provinces and the subordinate Dominion officials; the provincial officials being appointed by the Provincial Governments.

All the acts, legislative or executive, of the provincial or the general government are performed in the name of the Sovereign.

The Legislature of the Dominion consists of two bodies: one, the House of Commons, is elected by the people of the different provinces from constituencies indicated by the Commons itself; the other, the Senate, is "appointed by the Crown,"—in reality by the Crown's ministers. These two bodies must concur in each measure before it can become law.

Each province has a government similar to that of the Dominion, except that Ontario, Manitoba, and British Columbia have but a single legislative body, viz., the one elected directly by the people.* The North-West districts are too thinly settled for provincial organization; they are, therefore, under the more immediate control of the Dominion Government, and have a governor and a council appointed by the Crown.

25. The inhabitants, numbering 4,324,810 in 1881, are of many nationalities—natives of the British Islands and their descendants constituting the majority. (See under each province.) There are some Eskimos in Labrador, and farther north. The roaming Indians are almost all confined to the western territories and Labrador. Others, in the various provinces, have reservations of their own secured to them, and have, in a great measure, adopted the customs and ways of living of civilized life; still others own property, and in all respects live as ordinary people.

In *religion*, the Christian worship is universal. In all the provinces except Quebec, the Protestant sect is largely predominant; in Quebec it constitutes a very small minority. Perfect freedom of worship exists everywhere in the Dominion.

Education is liberally provided for by the local government in all the provinces, as well by High Schools and Colleges as by Public Schools. It is thus heartily recognized that the welfare of countries depends upon the intelligence of their people.

* See further in Authorized History of Canada.





FIG. 44.—CITY OF TORONTO.

PROVINCE OF ONTARIO.

1. **Extent.**—Starting at about the central part of Lake St. Francis, on the south the boundaries of Ontario extend westward, traversing all the southern waters of Canada, as far as the western part of the Lake of the Woods; thence on the north and west, along the English and Albany rivers, with the connecting lakes, to James Bay; and from the south-eastern end of this, along the meridian of $79\frac{1}{2}^{\circ}$, to Lake Temiscamingue; thence along the Ottawa to a point directly north of the central part of Lake St. Francis, the remainder of the boundary being a line running irregularly southward.

Excepting British Columbia, Ontario is the largest of the provinces; its area is about 220,000 square miles.

2. **Geological Features.**—The peninsula enclosed by the lakes rises very gently from the lakes on each side to the crest of the swell that runs from the southern end of Lake Huron, in a direction parallel to lakes Erie and Ontario, till it meets the branch Laurentian swell that passes into New York State. In the hollow formed by this branch swell and the main Laurentian swell, lies

the Ottawa river. These three ridges are the water-sheds of Ontario.

Along the shores of the lakes, especially Ontario and Erie, lies a low, narrow strip of land; in some places, as from Queenston around to Toronto, this ends at a very abrupt escarpment of limestone rock, that is plainly visible at many points.

In the Laurentian region the country is rugged, with much wild, picturesque scenery, but containing many tracts of fertile land.

The rocks west of the Laurentian, and underlying the "glacial drift," are chiefly limestones; they are of the palæozoic age, and of the same series as those skirting James Bay—the older Silurian; they extend as far west as a line drawn from Port Credit to Georgian Bay. Then follow the Silurian proper in a broad, uniform band, extending from near Woodstock to Lake Huron, and including all the Niagara peninsula except the Lake Erie coast; the Devonian occupying all the Lake Erie shore and the rest of the peninsula. (See Part I., Fig. 2.)

3. **Minerals.**—The metalliferous minerals of Ontario lie almost exclusively in the Laurentian region. What their extent and variety are, is not known. There is an abundance of iron, and in many places along the north

shore of the upper lakes, *copper* has been found, and also *lead ore* (galena) here and there.* “Silver islet,” on Lake Superior, is very rich in *silver*; 87,024 ounces of pure silver were obtained in 1881. *Zinc* also is said to exist along Lake Superior. *Iron ore* is the only metalliferous ore mined to any extent in Ontario. The iron producing counties are Frontenac, Renfrew, Lanark, Carleton, and Hastings.† *Apatite*‡ (phosphate of lime), of excellent quality, used largely as a fertilizer when prepared, exists along the Ottawa in apparently large quantities. *Gold* is mined to some extent in North Hastings. The Lake of the Woods region promises to be rich in gold. The western peninsula, in Lambton, yields large quantities of *petroleum*; about 15,500,000 gallons of the crude petroleum were produced in 1881: farther north, in the neighborhood of Goderich, wells have been bored that yield strong brine, from which most of the *salt* used in the central Dominion is manufactured; 472,000 barrels were made in 1881.

4. **Outline.**—The outline of Ontario is very irregular. The south-east is broken by the peninsula of Prince Edward County, and the Niagara peninsula; the south-west prolongation lying between the lakes is peculiar in character; it is a peninsula shaped like a barbed arrow-head,—the barbs being Niagara and Bruce peninsulas, the isthmus lying between Toronto and Georgian Bay. (See “Canada,” sec. 10, for other features in the outline.)

5. **Minor Lakes.**—The minor lakes exist almost exclusively in the Laurentian region, or in the northern part of the region (the older Silurian) that overlies it to the south. (See Pt. I., “Land Surface of the Earth,” sec. 30.)

Simcoe, north of Toronto, occupies a depression on the crest of the ridge running from Lake Huron north-eastwardly (see sec. 2), and drains off through the Severn River into Georgian Bay. East of this lake lies a whole fantastic chain—*Scugog*, a ring of water enclosing a large island; *Balsam*, *Sturgeon*, *Pigeon*, *Chimong*, *Stony*—all but the first being in reality only one long, very irregular body of water, and *Rice*. The whole of these, with numerous smaller ones, drain off into the western end of the Bay of Quinté through the Trent River. Farther east still, are *Rideau* Lake and numberless others, running off into the Ottawa River through the Rideau River. North of Lake Simcoe is *Muskoka* with its connected lakes, *Joseph* and *Bosseau*, having as its outlet into Georgian Bay, the Muskoka River. Farther to the north, on a line with the northern part of Lake Huron, is *Nipissinu*, which, after getting the waters of other lakes to the north, overflows into the north of Georgian Bay through the rocky, wild French River. Directly north, but on the very top of the Laurentian “height of land,” is Lake *Abittibi*, which drains off into James Bay through the Abittibi River. West from this, Lake *Nipigon*, the largest of hundreds of lakes in that region, is but a short distance north of the central part of Lake Superior, into which it runs through the Nipigon River. In this region the watershed is close to Lake Superior, and on its western side begins that chain of little lakes, known as *Rainy River*, that passes into *Rainy Lake*, thence into *Lake of the Woods*, and finally through Lake Winnipeg and the Nelson River into Hudson Bay.

The *English River* (north-west boundary) is one chain of lakes—*Lac Seul* (Lonely Lake) and *Lake St. Joseph* being the largest. From this last the *Albany* flows into James Bay.

6. **Other Rivers** (See “Canada,” sec. 9).—In the west, *Pigeon*, part of the boundary between the United States and Canada, flowing into Lake Superior; *Saugeen*, flowing into Lake Huron, and the *Thames* into Lake St. Clair. On the south the *Grand*, starting where the Saugeen starts, and flowing into Lake Erie, and the *Moir* into Bay of Quinté.

In the east, the *Madawaska* and *Montreal*, running into the Ottawa. On the north, the *Moose*, emptying into James Bay.

The *Niagara* is only thirty-four miles long, but it is one of the remarkable rivers of the world.

Fourteen miles from its mouth occur the Falls of Niagara. Divided into two channels by Goat Island, the greater mass of the water falls over the cliff on the Canadian side, a perpendicular height of 167 feet, forming the “Horseshoe Falls.” On the United States side the cliff is 158 feet high, the volume of water being small in comparison with that of the other, but breaking in foam from the very top and forming wild rapids far up the stream. Below the fall, for two miles the stream flows quiet, but strong, between perpendicular cliffs over 200 feet high; then another rapid occurs, in which is the “Whirlpool,” formed by a bend in the channel. At Queenston the level of the lake is reached—the whole fall in the river bed being 330 feet. Several fine bridges cross the river, the chief one being at Clifton—the famous Suspension Bridge. (For the St. Lawrence and Ottawa, see under Quebec.)

7. **Climate.**—Ontario has its maximum breadth along the meridian of about 82° 30', which passes through Point Pelee, on Lake Erie (lat. 42°), and the mouth of the Albany River (lat. 52°). It has thus a greater extent north and south than any other province of the Dominion except British Columbia. But as almost the whole of it is within the influence of the lakes, and the

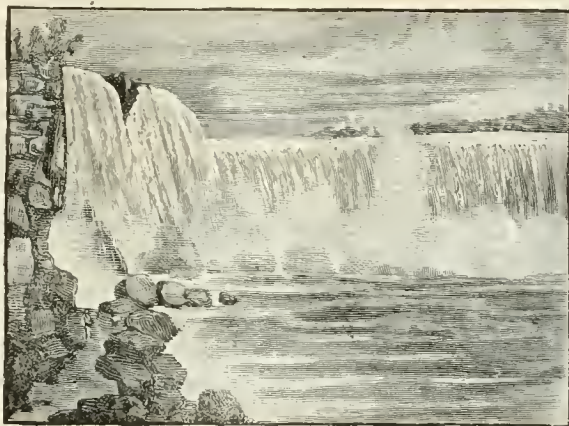


FIG. 45.—NIAGARA FALLS.

* In 1884, 155 tons of lead were made at the Kingston Smelting Works from 293 tons of galena from Carleton county.

† The total output of ore from these counties in 1884 was about 80,000 tons. The ore from Hastings is found to make the finest of steel.

‡ The mines are owned mainly by capitalists in England and the United States. The crude apatite, the output of which was large in 1884, is worth, in Montreal, \$15 a ton. At Brockville a few tons were manufactured into fertilizers; all the rest was exported crude.

southern peninsula is within the warm temperate zone, Ontario is less exposed to extremes of heat and cold than any other inland province.

The following statements regarding the average temperatures at Toronto in forty-three years, are taken from the report, for 1883, of the directors of the Magnetical Observatory, Toronto:—

Mean temperature	44° 27
“ “ warmest month (July)	67° 69
“ “ coldest “ (January) ..	22° 87
“ highest temperature	91° 0
“ lowest “	-12° 0
“ range of “	103° 0
Highest temperature	99° 2
Lowest “	-26° 5

Lake Erie shore will show a higher mean annual temperature than 44° 27, and a much higher winter mean than 22° 87; while the extreme north is said to have a summer mean of 60, a winter mean of zero, and an annual mean of 32°—the last a fact that shows the little value of “mean annual temperatures” in indicating the capabilities of a “cold temperate” climate. (See “North America,” sec. 13; and “Canada,” sec. 11.)

Moisture.—Rain is not excessive in Ontario; it is fairly distributed from April to October, but is much more abundant in spring and fall than in summer. The average annual rainfall during the last 43 years was about 28 inches, with an average of 111 rainy days; while the snow-fall was 69 inches, the extremes being 43½ inches of rain, and 123 inches of snow.

8. Vegetation.—The vegetation has already been referred to. (See “Canada,” sec. 12.)

9. Industries.—The great industry of Ontario is *farming*; the extent of this industry is indicated by the fact that the census of 1881 gives the number of the agricultural class in Ontario at 304,630, the number in the whole Dominion having been 662,630.

The *Forest* industry stands next in importance. The value of the products of sawmills alone in 1881 was over \$16,500,000.

Manufacturing ranks third. In 1881, \$81,000,000 (not including value of raw material) were invested in manufacturing, and goods to the value of \$158,000,000 were produced.*

The chief manufactures are flour, lumber, cloth, boots and shoes, agricultural implements, cheese, carriages, furniture, cars and engines, leather, and oil.

* These figures include all kinds of manufactures for domestic, interprovincial, and foreign trade.

Mining is not as yet an industry of Ontario, nor is *shipping*, though the number and value of vessels on the inland waters are considerable.

The *Fisheries* are highly important to the province: the amount of fish exported is small, the home market evidently taking nearly the whole.

For further reference to this and the other industries, see Appendix I (i) and (j).

Lake Huron, with its offshoots, is the most important for its fisheries, yielding more than half of the value of the entire quantity of fish caught in the Province. It supplies three-fourths of the trout, over half of the whitefish, half of the pickerel, and a third of the sturgeon. Lake Ontario gives most of the bass and maskinonge; Lake Erie, most of the herring and the pike.

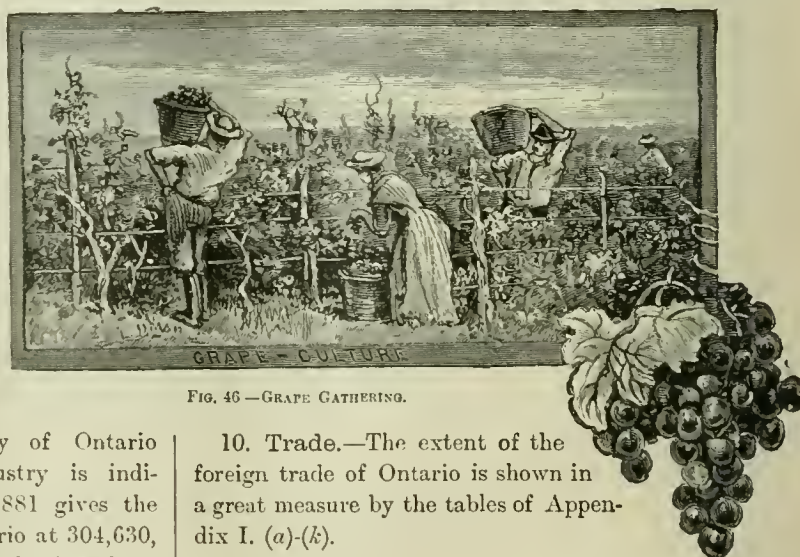


FIG. 46 — GRAPE GATHERING.

10. Trade.—The extent of the foreign trade of Ontario is shown in a great measure by the tables of Appendix I. (a)-(k).

11. Education.—In educational facilities Ontario is surpassed by no other country in the world. Public Schools, within the reach of all, are absolutely free; High Schools, one or more being within each county, and either free or with but nominal fees, carry to a higher point the training received in the Public Schools. In each of these efficiency is sought through a course of study prescribed for the pupils, through a careful literary and professional training of teachers at Normal, Model, and High Schools, through official inspection, and by means of municipal and provincial support. University College and University of Toronto complete the system of education provided by Government.

Education forms one of the departments of the Provincial Government, and is in charge of a cabinet minister—the Minister of Education.

In addition to the public system of education, the leading religious denominations have colleges, and sometimes schools, of their own, free from Government control.

12. Sub-divisions.—The principle of self-government—local control of purely local matters—extends throughout the British empire, as well to the smallest communities as to the different countries that constitute the empire. In the mother-land, but more especially in the colonies, the principle is carried out to a very full extent; in dependencies, India for example, in a modified form suited to circumstances.

In Ontario, and in some of the other provinces, the organization of the communities of whatever character, is the same as that of the province at large. Some parts of the country, however, are too thinly settled to render organization for a full local government convenient or possible. In this case the provincial government must exercise a more or less direct control in local affairs, the principle of self government, however, being carried out as far as circumstances allow.

The largest community, or sub-division, of Ontario is termed a *county*. It has its own governing body, the "council," chosen by the people, and its own fixed place for transacting business,—the county town. A further sub-division gives the *township*, with an organization similar to that of the county. A thickly settled locality may obtain an organization of its own under certain conditions; if it has 750 inhabitants it will be an *incorporated village*; when it has 2,000 inhabitants it may become a *town*, having a mayor and councillors, and entitled to send one or more representatives to the county council: on reaching a population of 15,000 it may receive a fuller organization and become a *city*. The last is free in all respects from the control of the county council, the others are subject to it. A town, however, may separate itself wholly from the jurisdiction of the county council.

These divisions are merely for local or municipal government, and need not, and except in the case of the large cities do not, form constituencies for sending representatives to the legislatures; each legislature indicates its own constituencies.

Ontario has forty-five counties and, in the northern part of the province, five "districts" without county organization.

13. Of the inhabitants, 1,923,228 in number, according to the census of 1881, three-quarters were born in Ontario, a fifth in the British islands, 45,454 in the United States, and 55,816 in different foreign countries, the remainder being natives of the other provinces. A large number of the inhabitants of the eastern counties—especially of Glengarry, Stormont, Prescott, Russell, and Renfrew—are of French descent. Over a third of the

inhabitants of Essex are also French. Indians of different tribes, to the number of 15,325, are settled for the most part on special reservations, the principal of these being in Manitoulin island, in Algoma, and in the counties of Brant, Hastings, and Middlesex.

14. Cities.—There are eleven cities in Ontario—Toronto, Hamilton, Ottawa, London, Kingston, St. Catharines, Brantford, Guelph, Belleville, St. Thomas, and Stratford.

Toronto (population, 86,415 in 1881; present estimate, 112,000), the capital and, next to Montreal, the largest city of the Dominion, owes its prosperity in some measure to its being the seat of the provincial government; but, like other important cities, the greater part is due to those physical conditions that are favorable to commerce. It possesses a well-sheltered

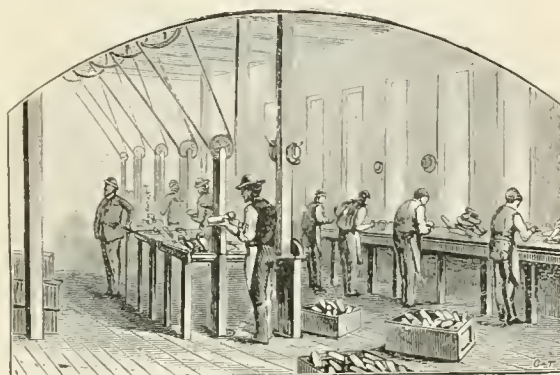


FIG. 47.—BOOT AND SHOE FACTORY.

harbor on that part of the lake coast that is most convenient and accessible to a wide extent of rich farming country, the collected products of which it can readily despatch, either by land or by water, to the markets of the United States or of Europe. The same causes render it convenient for the distribution of goods, either those imported or those manufactured at home. Toronto is a commercial rather than a manufacturing city, though, like all large cities, its manufactures are both numerous and important. The chief of these are, machinery of various kinds, articles of iron, agricultural implements, articles of leather—boots and shoes especially,—furniture, clothing, musical instruments, and malt and distilled liquors. Beside these, it distributes the goods—such as paper, furniture, and knitted goods—of many of the large

factories situated in country towns and villages where motive power and needful material are more convenient, or property cheaper.

The city rises gradually back from the lake, reaching in about a mile and a half an elevation of somewhat over a hundred feet. It is healthy, and is said to be less subject to extremes of heat and cold than any other northern inland city on this continent. Toronto is the educational centre of the province, as well as the capital and commercial centre. It contains the University College and the University of Toronto, the School of Technology, McMaster Hall (Baptist), Wycliffe College (Church of England), St. Michael's College (Roman Catholic), Knox College (Presbyterian), Trinity College (Church of England), the Normal and Model Schools, and Osgoode Hall,—the latter containing also the chief law courts of the province. There are but few railways in the province that do not communicate directly or indirectly with Toronto, bringing in the varied products of the country, even from as far as Lake Nipissing. The churches and other public buildings are, for the most part, fine structures, University College, especially, being unsurpassed in architectural design by any building for a similar purpose on the continent.

Many of the private residences are also fine substantial buildings, marked by good taste rather than by showiness. In enterprise, energy, intelligence, and in substantial and rapid progress, Toronto is a typical Ontario city.

Hamilton (population, 35,961 in 1881; present estimate, 42,000), the next in size to Toronto, lies at the head of a little, almost land-locked, basin of water called Burlington Bay, the extreme western end of Lake Ontario. The general flatness of the city is relieved by a bold limestone bluff, termed "the moun-

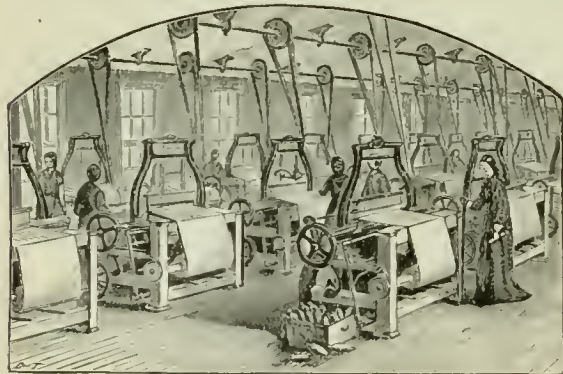


FIG. 48. COTTON FACTORY

tain," an abrupt exposure of the rock along the edge of the sudden rise that the land takes around Lake Ontario at varying distances from the water. A large number of the residences and the public buildings are built of stone, which gives to the city a substantial appearance. Physically less favorably situated for commerce than Toronto, Hamilton has, nevertheless, a large wholesale trade, and its manufactures are important. Its stoves, castings, machinery, glassware, sewing machines, boots and shoes, clothing, and agricultural implements, are found in all parts of the Dominion.

Ottawa (population, 27,412 in 1881; present estimate, 30,000), the capital of the Dominion, is situated about 125 miles up the Ottawa river, where that stream, after passing over a ledge of Laurentian rock, and forming the Chaudière Falls, receives the Rideau, pouring in a "curtain" of water over rocky banks forty feet high.

The importance of the city in Canada is altogether due to its being the capital—the centre from which the political affairs of a vast country are administered. But the character of its physical situation would, of necessity, have made it important—provincially at least. In years gone by, the facilities that the Rideau, assisted by short canals, offered for communication with the western country, and its safe distance from a possibly hostile frontier, caused this place to be regarded by the Imperial Government as a desirable site for a city, from both a military and a commercial point of view. It is the rapid development of the lumber industry in the upper Ottawa valley that has given the city its chief commercial and provincial importance, an importance that must increase when the rich mining capabilities of the surrounding country come to be developed.

The presence of the falls necessitates the re-handling of the vast numbers of logs that descend the river. A large portion of these are sawn into lumber by numerous mills driven by the unequalled water-power afforded by the falls; the rest are made ready to pass the descent by means of artificial water-ways, or "slides," in order to be transported to the St. Lawrence.

Industrially, therefore, Ottawa is emphatically a lumber city, though woollen goods and flour are also important articles of manufacture. The census of 1881 returns Ottawa as manufacturing lumber to the value of nearly \$2,000,000, exceeding greatly in this respect every other city in the Dominion, even St. John, New Brunswick.

Ottawa has the "extreme" Canadian climate,—cold and clear in winter, warm in summer.

The appearance presented by the city on the high banks and bluffs of the river is picturesque and attractive, while waterfalls like the Chaudière give a charm to any place. Ottawa contains many handsome structures,—churches, private residences, stores, banks, etc. The Parliamentary and Departmental Buildings are especially fine, and are regarded as models of architecture.

London (population, 19,746 in 1881; present estimate 22,000), in the centre of the rich agricultural western peninsula of Ontario, is well situated as an inland commercial town. Its growth has been rapid and substantial. And while its wholesale trade in goods, imported directly from other countries, is large, its own manufactures are important.

These manufactures consist of agricultural implements, furniture of all kinds, machinery, railroad cars, boots and shoes, refined petroleum, and malt liquors. Its mineral springs attract a number of visitors during summer time. The Western University and Hellmuth Ladies' College are situated in London.

Kingston, the "limestone city" (population, 14,091 in 1881; present estimate, 15,000), was formerly of greater relative importance in Ontario than at present. It has not increased with the same rapidity as other Ontario cities.

Its position, at the outlet of Lake Ontario, is important in lake and river navigation, and, in consequence, its leading industries are connected with such navigation.

Vessels built for lake navigation only, here transfer their cargoes to barges and other river boats to be taken to Montreal or further; while these, in their turn, transfer to the lake boats cargoes brought from Montreal. A considerable amount of building and repairing of vessels is also carried on.

In addition to these industries and a considerable trade in grain, especially barley, Kingston manufactures engines, machinery, leather, knitted and cotton goods, brick, cut stone, malt liquor, etc. It has also smelting works for extracting metal from the ore. Queen's College and University, the Military School, and the Provincial Penitentiary, are situated here.

The river trade has not kept pace with the growth of the country. Rapidity of transportation being a necessity in modern commerce, a great deal of the water traffic has been transferred to the railroads. This, together with the opening up, on the other side of the lake, of a large market for Canadian grain, and a more direct route to the ocean, has materially affected the prosperity of Kingston. Though the agricultural region around Kingston is not extensive, the mineral region is one of the best in the world. The iron of Madoc makes the finest of steel. With the development of the iron mines in the counties to the north, Kingston should become the centre of the iron trade and iron manufacture for central Canada.

The Rideau Canal, traversing the Rideau River and the Rideau and other lakes, connects the city with Ottawa; but the railroads and the St. Lawrence canals have almost destroyed its usefulness.

Of the smaller cities, each having about 10,000 inhabitants, *Guelph* has a large trade in grain and cattle, and manufactures flour, agricultural implements, sewing machines, musical instruments, and malt and distilled liquors. The Agricultural College and Experimental Farm are near Guelph.

Brantford, on the Grand River, is for the most part engaged in the produce trade; but it has extensive manufactures of machinery and agricultural implements. It contains the Institute for the Blind.

St. Catharines is in the best fruit region of Canada. The Welland Canal supplies water power for flour mills and different factories. Like Kingston, St. Catharines has suffered through the transfer to the railroads of a large part of the traffic by water. It has mineral springs that are much resorted to in summer.

St. Thomas, where three railroads intersect, has grown rapidly in the last few years. It has an inland country trade.

Belleville, on the Bay of Quinté, has a large trade in lumber, dairy produce and grain, barley especially. It contains the Institute for the Deaf and Dumb.

Stratford, the newest city (1885), is a very active railway centre, with extensive railway workshops. It has a large trade in grain and dairy produce.

15. Towns.—A characteristic feature of Ontario towns and villages is that, while each one is a local and often important market for local agricultural or other products,

each also has, in addition to a flour mill and a saw mill, one or more manufactories. These, in the majority of cases, not only supply the immediate neighborhood with the articles manufactured, but send their goods throughout the Dominion, and often to other countries. The cities and larger towns by no means monopolize the manufacturing.

All the northern and east-central towns, and also those at the mouths of rivers along Lake Ontario and the St. Lawrence, are largely concerned in the lumber trade. Of these, the principal are *Owen Sound*, *Collingwood* (which have steamboat communication with Lake Superior), *Burrie*, *Lindsay*, *Peterborough*, and *Perth*; *Port Hope*, *Napanee*, and *Brockville*, on the south,—the last having chemical works also; in a wild country, in the extreme west, at the outlet of the Lake of the Woods, is *Rat Portage*, one of the great lumber centres of Canada.



FIG. 49.—OIL-VELLS AND DERRICKS.

Many of the chief manufacturing towns are along or near the principal lines of railway. *Prescott*, at the junction of a railway to Ottawa, has no special manufactures. *Cornwall* manufactures woollen goods, machinery, cotton, and paper; *Cobourg* (containing Victoria College and University) has large ear works; *Bowmanville* and *Oshawa* make agricultural implements, furniture, and musical instruments; *Whitby*, leather, agricultural and other machinery, carriages; *Galt* (the "Manchester of Canada"), machinery of all kinds, edge tools, woollen, and knitted goods. In the neighborhood of the last town are *Paris*, *Ayr*, *Preston*, etc., having large woollen mills, breweries, agricultural implement works, and other factories—it is the manufacturing region of Ontario.

The towns to the west, *Ingersoll*, *Woodstock*, *Chatham*, *Simcoe*, and others, have manufactures of implements, etc., suited to agricultural communities. *Petrolia* is the centre of the oil-producing region.

The chief port towns, other than those already mentioned, are: on Lake Superior, *Port Arthur*, on the north-western coast; on Lake Huron, *Southampton*, with a line of steamers to Lake Superior, *Kincardine*, *Goderich*,—with extensive manufactures of salt, from salt-wells in its vicinity,—*Sarnia*, the western terminus in Canada of the Grand Trunk Railway. The port towns of Lake Erie are of little importance, the chief being *Port Stanley* and *Port Dover*. *Port Colborne* and *Port Dalsouse* are small places at the ends of the Welland Canal. *Windsor*, a thriving town, is the western terminus of the Great Western Railway. At *Amherstburg*, the Canada Southern Railway crosses the Detroit River. *Niagara*, at the mouth of the Niagara River, is not well situated commercially, and does not grow.





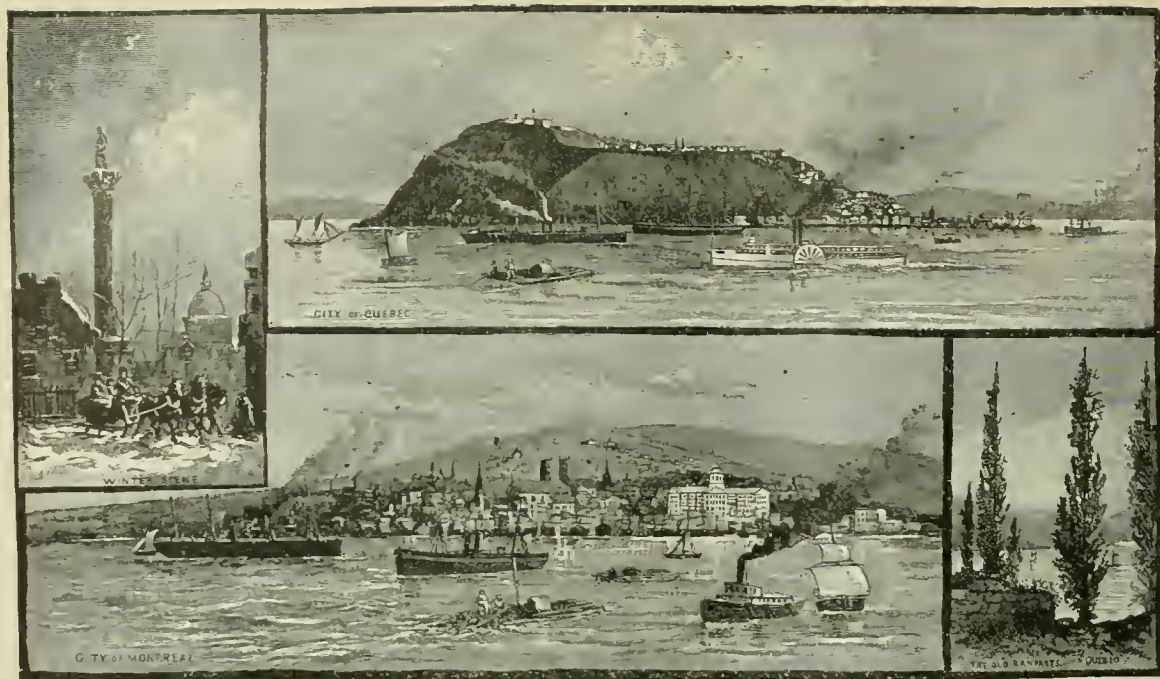


FIG. 50.—VIEWS OF QUEBEC AND MONTREAL

PROVINCE OF QUEBEC.

1. **Extent.**—The southern boundary of Quebec includes that of the Dominion north of the States of New York, Vermont, New Hampshire, and Maine, as far as the St. Francis River; a line running irregularly to the river Patapedia; and this river, the Restigouche, and the Bay of Chaleur; the eastern boundary is the Gulf of St. Lawrence and about the meridian of 57° on the north-east; the northern boundary runs along the parallel of 52° to the "Height of Land"; this it follows to the eastern boundary of Ontario. The area of the province is 188,688 square miles.

2. **Geological Features.**—Quebec has three distinct physical regions, each depending upon different geological features.

The western ridge, or main axis of the Appalachian chain, enters the province, with Mount Sutton (4,000 feet high), somewhat to the west of Lake Memphrémagog, and extends, under the general name of Notre Dame, to Cape Rosier in Gaspé, being everywhere, after reaching the neighborhood of the city of Quebec, within

a few miles of the St. Lawrence. The elevation is hardly beyond that of hills till the Shickshock Mountains, a parallel range to the north, between the Matane and St. Anne rivers in Gaspé, are reached; there some peaks, such as Bayfield, Albert, and Logan, are from 3,500 to 4,000 feet high.

Gaspé is a table-land about 1,500 feet high, from which the Shickshock range rises, as do other parallel ranges of lower elevation, and of a less continuous character, farther south. But little, however, is accurately known of the interior of this peninsula, the settlements being confined to the coast and its neighborhood.

These Appalachian mountains, although forming the southern watershed of the St. Lawrence basin, are not always the highest of the range. "The Shickshock Mountains, though the highest land, do not form any part of the water-parting of the peninsula (Gaspé), for the Ste. Anne des Monts, the Matane, and the Châte, taking their sources in the lower country to the south, cut gorges through the range so deep that their channels,

where crossing it, are not more than 500 or 600 feet above the St. Lawrence." The larger rivers in the south-east all have their upper basins to the south of the main range.

The whole of this region has its strata very much disturbed, broken, and folded, and, as far as ascertained, consists of three narrow belts; the centre one, of crystalline rock, "extends from Sutton Mountain to a few miles north of the latitude of Quebec, and reappears in the Shickshock range;" the southern one, of palæozoic (Devonian) rock, extends from the Vermont border to Gaspé; while the northern one, a narrow belt of the oldest (Cambrian) palæozoic, extends from the Vermont border to Quebec, and thence skirts the St. Lawrence shore to Cape Rosier.

"Notwithstanding the general hilly, and sometimes mountainous, and thickly wooded character of Eastern Canada, there are many fine stretches of agricultural and pastoral lands, most of which are due to the modification the surface has undergone during the formation of the glacial and later deposits of the Post-Tertiary Age, which have filled in and obliterated many of the irregularities of the surface of the ancient disturbed and corrugated rock formations."

The second region includes the rest of Quebec south of the St. Lawrence. It is of a totally different physical appearance from the former region. "Excepting the isolated trap hills, at Montreal island and in its vicinity, which probably mark the sites of volcanic vents, this area is absolutely devoid of mountains or even of prominent hills. It presents a broad level or slightly undulating expanse of generally fertile country."

The strata are palæozoic of the two oldest series.

The third region is that north of the St. Lawrence—the eastern part of the great Laurentian area. (See "Canada," sec. 2.)

3. Minerals.—Like Ontario, Quebec possesses no coal deposits. Wherever the crystalline (metamorphic) rocks occur, economic minerals are found associated with them, though not always in large quantities.

Iron is found throughout the Laurentian area, and is worked chiefly in the neighborhood of Three Rivers; it is found also in the crystalline belt south of the St. Lawrence. Gold is found in considerable quantity in Beauce county in the crystalline belt, and several large mines are worked there. In the same belt the largest and most pro-

ductive copper mines in Canada are located. *Apatite*, in apparently inexhaustible quantities and of excellent quality, exists in Ottawa county especially, the richest mines being located along the Rivière du Lièvre. In the same county are extensive deposits of *graphite* (*plumbago*, or *black lead*). *Silver* occurs in the crystalline areas north and south of the St. Lawrence. *Mica* is mined to some extent. *Marble* and *Building Stone* are quarried, the latter in large quantities. (See Appendix I. (l).)

4. Outline.—Quebec is more compact than Ontario, although its southern part, from Quebec city eastward, is divided from the northern part by the broad waters of the lower St. Lawrence and by the Gulf. This part of the province terminates in the peninsula of *Gaspé*.

5. Capes.—The course taken by vessels in navigating the lower St. Lawrence is usually along the southern shore. Mail steamers from Europe land passengers and mails at *Father Point*, near Rimouski. At the end of the peninsula are Cape *Rosier* and the fantastically shaped Cape *Gaspé*, while *Point Macquereau* (*mak-er-ó*) is in the south-east, at the entrance of Bay of Chaleur. *Point des Monts* is below the Saguenay on the north shore.

6. Islands.—The large island of *Anticosti*, in the western Gulf, thickly wooded with spruce and pine, has but few inhabitants, and at present is chiefly valued for its fisheries of cod and herring. In the southern Gulf are the *Magdalen Islands*, the most important being *Grindstone* and *Amherst* islands; they are very valuable for their cod, lobster, and seal fisheries. *Bonaventure Island*, off Percé (*Gaspé* peninsula), is also engaged in the fisheries.

The whole northern shore of the Gulf, from *Anticosti* eastward, is thickly lined with small islands, the south shore having none below *Father Point*. West of this latter point on the south the islands are quite numerous, some being in mid-channel of the river, a perfect archipelago existing east of the island of *Orleans*. This island lies just below Quebec, and is about twenty miles long.

At the upper end of Lake St. Peter are a number of low, flat alluvial islands; at the junction of the St. Lawrence and Ottawa, are *Montreal Island* (32 miles long), containing the city of Montreal with its "Mount Royal," of trap rock, *Isle Jesus* and *Isle Perrot*, while a little way up the St. Lawrence, at the lower end of Lake St. Francis, is *Grande Isle*. The islands of the river, like the adjacent mainland, are generally fertile.

In the Ottawa, at some distance above the city of Ottawa, are the large islands of *Calumet* and *Allumette*.

7. **Coast Waters.**—Besides the Gulf of St. Lawrence proper (see "Canada," sec. 8), there are no bodies of water around the coast beyond those formed by little irregularities of coast outline; *Gaspé Bay*, about 25 miles long, at the extremity of the peninsula, and *Bay of Seven Islands*, on the north shore of the Gulf, being the largest.

8. **Rivers.**—The rivers of Quebec run into the St. Lawrence either directly or indirectly through the Ottawa. The descent from the crest of the watersheds to the depression occupied by the St. Lawrence is direct, the affluents running in a course at right angles to the main river,—the Ottawa excepted, for it lies where the Laurentian area curves to the north-west, and it takes its course from that curve. As the Laurentian plateau has a considerable elevation, and the crest of the watershed is comparatively close to the St. Lawrence, the rivers of necessity have a swift current, and abound in falls, rapids, and gorges,—some of the latter being very deep. (See "Canada," sec. 9.) To the south the elevation varies. In the south-west a long stretch of level country lies between the river and the mountains; consequently, except in the vicinity of the mountains, there are few falls of importance. Below Point Levis the rivers are mostly mere torrents.

The *St. Lawrence* is properly a Quebec river. On issuing from Lake Ontario it is 232 feet above the level of the sea, and first meets with tide-water at Three Rivers, distant 272 miles—an average fall of about 10½ inches in a mile. The fall, however, is not uniform throughout. Till a short distance below Prescott the current is moderate; then a sudden fall in the bed causes a rapid—the *Galops*. At some distance farther down another fall with another rapid, the *Plat* (Flat) rapid, occurs, followed shortly after by the *Long Sault*, eleven miles of nearly continuous rapid, ending at Cornwall, where the Province of Quebec is reached. On leaving Lake St. Francis three rapids follow in quick succession, the *Coteau*, the *Cedars*, and the *Cascades*. Where the river leaves Lake St. Louis occur the famous *Lachine* rapids, nine miles above Montreal, the last and

finest of the rapids. At one point in the Cedars the current is said to run at the rate of thirty miles an hour. The Cornwall canal at the Long Sault, the Beauharnois at the next three, and the Lachine ending at Montreal, are the chief canals. Below Montreal the current is but slight, and there is no serious obstacle to navigation in the river till Lake St. Peter is reached. Through this the channel has been deepened to twenty-seven feet by dredging, so as to allow the largest ocean-going steamships to pass up.* But, as with all places filling, or filled, up with sediment, the channel often has sharp curves, so that care is required in navigating it; this is also the case at some distance above Quebec, where islands and long ledges of rock rise just above the water

in mid-channel. Below Quebec, however, though islands are numerous, the channel is never narrow. This part of the river may be regarded as the prolongation of the Gulf, for just below the island of Orleans it is ten miles wide, and at Point des Monts twenty-five. The volume of fresh water carried down by the river is so great that for a long distance below the city of Quebec the water is perfectly fresh, the tide at the



FIG. 51.—LACHINE RAPIDS, ON THE ST. LAWRENCE.

city and above it being merely this water "backed up" by the pressure of the salt water advancing from the Gulf. Some suppose that the volume of water passing out of Lake Ontario is greater than that which enters, and that, therefore, a subterranean source of supply must exist.

A serious drawback to the usefulness of the St. Lawrence, as of all northern rivers, is the fact that it freezes over and remains frozen for five months of the year.

The *Ottawa*, some 750 miles long, lies throughout its whole course in a peculiar depression of the Laurentian area. Starting in the little lake Eschawaham, somewhat to the south of the "Height of Land," at a point directly north of the city of Ottawa, the river flows

* The work of deepening began in 1840; at that time the channel was but eleven feet deep.

westward in an extremely tortuous course abounding in lakes, a thoroughly typical Laurentian stream, till it reaches Lake Temiscaming; there it turns at right angles, and, till the Chaudière Falls at Ottawa are reached, it is a succession of rapids, falls, and long, deep, and often broad reaches of quiet water, frequently flowing between high, perpendicular banks. Below Ottawa there is a long stretch of unbroken stream as far as the village of Grenville; then fully twelve miles of rapids occur, the chief one being the *Long Sault*, six miles in length. The Grenville canal leads past this rapid. Other rapids occur before the St. Lawrence is reached. The principal of the three outlets of the river discharges its discolored water into Lake St. Louis.

The *Saguenay*, for the last 75 miles of its lower course, flows between cliffs that are often 1,200 feet or more in height. Its waters are deep and dark, abounding in fish. Near the upper end of this reach, a short arm of similar character, called Ha Ha Bay, puts off from the main stream. The wild scenery and the excellent fishing bring numbers of tourists to this river.

The other chief rivers flowing from the Laurentian area are the *Gatineau* and the *du Lièvre* into the Ottawa, and the *St. Maurice* into the St. Lawrence. This river, which has very many tributary streams, is said to be 400 miles long.

From the Appalachians come the *Richlieu* out of Lake Champlain, the *Yamaska*, the *St. Francis*, the *Chaudière*, the *Etchemin*,—all but the first having their upper courses to the south of the main axis of the Appalachians, and crossing this axis through deep gorges.

9. Lakes.—Beside the expansions along the St. Lawrence and the Ottawa, the whole of the Laurentian area is dotted over with lakes, the largest being *Lake St. John*, from which the *Saguenay* starts. In the Appalachian region the chief are *Lake Champlain*, the cluster *Memphramagog*, *Magog*, *Massawippi*, *St. Francis*, *Aylmer*, drained by the St. Francis, and the *Megantic* and *Spider* by the Chaudière. The latter are about 1,100 feet above the sea-level, the former from 500 to 900.

10. Climate.—The climate of Quebec is somewhat more extreme than that of western Ontario in the same latitude,—it has not the modifying influences of the lakes. The heat of the southern part in summer is as great as that of Ontario, while the cold of winter is greater than in the same latitude of Ontario where affected by the lakes.

The rainfall is greater, as is also the snowfall.

(See "North America," sec. 13, 14; also "Canada," 11.)

11. Vegetation.—South of the St. Lawrence, even to the extremity of Gaspé, the ordinary grains are grown, though the height of the land in Gaspé exposes wheat and peas to injury from early frost. All west and south of Quebec city as far as the Appalachian region, is a fine agricultural country; in some parts of this area grapes and tomatoes ripen well in the open air. Large quantities of tobacco are raised, and also of flax and hemp.

The forests are practically inexhaustible. They cover nearly all north of the St. Lawrence and the Appalachian region to the south. But fires have destroyed very extensive areas, especially on the lower St. Lawrence. Except the narrow settled strip along the two great rivers—very narrow on the upper Ottawa and the lower St. Lawrence,—the whole of the province north of these rivers is given up to forest, not more than half of it being either surveyed or explored. The same may be said of the country on the south of the St. Lawrence east of the city of Quebec. White pine is found chiefly in the counties along the Ottawa, and to some extent in the south-east Appalachian region. Spruce is the principal softwood everywhere. Large forests of maple, with birch intermingled, exist in the western half of the province, while ash and birch are the chief hardwood trees in the east.

12. Industries.—The leading industries of Quebec are the following:

Agriculture.—The greater part of the inhabitants are engaged directly or indirectly in *farming*, and much attention is being paid to scientific agriculture through agricultural schools. Dairy farming is attracting special attention, much of the province being well adapted for grazing. In stock-raising, the eastern townships have always taken a leading position in Canada.

Lumbering.—This is the chief commercial industry of the province, and will long continue to be so. The innumerable streams that lead directly to the main artery, the St. Lawrence, afford everywhere excellent and ready means of transportation for forest products. From one end of the province to the other this industry is everywhere pursued.

Fishing is a highly important pursuit in Quebec, but, as an industry, it is altogether confined to the regions east of Quebec city, indeed, to Gaspé and the North Shore.

Manufacturing holds a prominent position, but, as in Ontario, the articles manufactured are mainly consumed locally or in the Dominion, few comparatively going abroad. The principal manufactures are flour, refined sugar, boots and shoes, fur goods, soap, locomotives, and maple sugar.

Mining is more of an industry than in Ontario, but does not hold a prominent position. (See Appendix I. (m)).

13. *Trade*.—Quebec is finely situated for trade, for through its ports must pass not only its own ocean commerce, but that of all the Dominion to the west. The great drawback to the city is the long period during which no vessels can ascend the river. (See Appendix I. (n) and others.)

14. *Shipping*.—Quebec stands second in the Dominion in extent of shipping, Nova Scotia being the first. In 1881 the census returns as owned in the province, 1,995 vessels, having a tonnage of 301,000; of these 293 were steamers, averaging 451 tons each.

15. *Education*.—As in Ontario, education is amply provided for through municipal and provincial support. There are ordinary and superior schools, besides others corresponding to the High Schools of Ontario.

There are also Model Schools and Normal Schools for the training of teachers, three universities—McGill at Montreal, Bishop's College at Lennoxville, and Laval (Catholic) at Quebec,—and a number of colleges.

Where Protestants are sufficiently numerous they have their own schools and inspectors. McGill Normal School is Protestant.

The control of the educational system is in the hands of a Superintendent of Public Instruction assisted by a Council, a majority of whose members are Catholics.

16. *Subdivisions*.—Quebec is subdivided for municipal purposes on much the same principle as Ontario—into counties, townships and parishes. There are sixty counties, twelve of which, in the south-east, are termed the “Eastern Townships;” these are largely peopled by descendants of the old United Empire Loyalists and contain most of the English-speaking inhabitants of Quebec, excepting those who live in the cities.

17. *Cities*.—Quebec (population, 62,446 in 1881; present estimate, 64,000), the capital, is one of the historic cities of America—among the earliest founded, and with its political fate involving, possibly, that of the whole continent. It is the third commercial city of the Dominion, but is surpassed by Hamilton, St.

John and Halifax, as well as by Montreal and Toronto, in the amount and value of its imports. Its imports in 1883 were valued at about \$5,000,000, its exports at \$9,269,000.

The export trade of Quebec consists mainly of forest products;—it is the great centre of the ocean lumber trade of Canada. Its trade in fish, both as an export and an inter-provincial commodity, is considerable; in agricultural produce there is but little trade of importance. The industries of the city, apart from the various saw mills, are not numerous; there is some ship-building with manufactures of tobacco and fur, soap and machinery; tanning, and boot and shoe making are carried on extensively, forming about one-half the value of all the manufactures of the city. These were valued at about \$10,000,000 in 1881.

The shipping of Quebec is important. In 1881 there were owned in the city, 101 steamers averaging 363 tons; 76 sea-going vessels averaging 651 tons, and 101 other craft averaging 59 tons.

The importance of Quebec has hitherto been as a military stronghold. The city consists of an “Upper Town” and a “Lower Town”; the latter, situated along the waterside of St. Lawrence and the St. Charles—a small stream that here enters the St. Lawrence—has the chief business houses connected with shipping; the former is built on the top of the high, steep banks that everywhere line the north shore. At the angle where the St. Charles unites with the St. Lawrence, the banks form a bold bluff 400 feet high, called Cape Diamond; on this a strong citadel is built that commands the approaches to the city.

Some seven miles below the city the little river Montmorency falls over the cliff into the St. Lawrence, a perpendicular height of 250 feet.

Montreal (population, 140,747 in 1881; present estimate, 200,000), is the largest city in Canada, and one of the large cities of the continent. Its position marks it out as an important commercial centre. Ocean steamers and sailing vessels, except the very largest, bring their cargoes up the river and discharge them here for distribution to the west, and then take on board the freight of the river boats and railroad cars,—goods of all kinds, that often come from points beyond the great lakes and outside of Canada. While the St. Lawrence furnishes a water-way directly to the

markets of Europe, the Richelieu, with its short canals and locks, opens up, through Lake Champlain and the Hudson, a water-way to the almost equally important markets and seaports of the United States.

The articles exported are the farm products of the west, and of the fine agricultural region in its own neighborhood—grain, flour, dairy produce, cattle, sheep, horses, etc.; the minerals of the counties to the north-west, furs from the west and the north, lumber from the Ottawa basin, and manufactures from Ontario and Quebec.

Its own manufactures are extensive and important; consisting of cotton and woollen fabrics, refined sugar, articles of tobacco, leather and leather goods, clothing, (including articles of fur), engines and machinery, castings



FIG 52.—THE TRAPPERS' RETURN.

of all kinds, soap, furniture, articles of wood, rubber goods, paint, paper, cars and locomotives, nails, saws, flour, and very many more. It is by far the most manufacturing city in the Dominion, the census of 1881 returning the value of the manufactures at nearly \$51,000,000.

The amount of trade carried on in Montreal is shown by the fact that, in 1883, goods to the value of \$27,000,000 were exported, and to the value of \$48,000,000 imported. In consequence of being the centre of external commerce, Montreal's trade is largely wholesale.

In shipping Montreal holds an important position. In 1881 there were owned in the city 100 steamers averaging 841 tons each, 17 sea-going vessels averaging 432 tons, and 123 other craft averaging 178 tons each.

The drawback to the city as a sea-port is the same as that to Quebec, with the important addition of a long river-navigation, often

through shallow and narrow channels, necessitating the employment of steam tugs for the assistance of other vessels.

The city is situated on the eastern side of the island of Montreal, which slopes gradually up to a short ridge of trap rock, called Mount Royal, which has its highest and boldest side fronting the city. The chief business quarters, the newer part of the city in the neighborhood of the mountain, as well as the colleges, numerous churches and ecclesiastical structures, and public buildings generally, are built, for the most part, of a dark-grey or bluish limestone, that presents a handsome massive appearance. This, and the mountain, with the beautiful residences high up on its sides, make Montreal, in the opinion of strangers, the finest city in America. No city in America has such massive wharves, piers, and river embankments,—a necessity here, for in the spring the ice-gorges, or "shoves," at this part of the river, are of a very dangerous character.

North of the St. Lawrence, except in the neighborhood of Montreal, all the little towns and villages are engaged in the lumber trade; below Quebec, in the fisheries in addition. *Three Rivers*, at the mouth of the St. Maurice, is finely situated for the lumber trade. It has also smelting works and foundries, iron being mined to a considerable extent in its vicinity. On the lower St. Lawrence are the summer resorts, *Murray Bay* and *Tadoussac*, (*Tad'-oo-sack*). *Hull*, opposite Ottawa, is a thriving "lumber town," with manufactures of woodenware, etc.

South of the St. Lawrence, below Quebec, the lumber trade and fisheries occupy the little towns and villages, the manufacturing being done mainly in the eastern townships and in the neighborhood of Montreal. The most important places are *Lévis*, opposite Quebec, the western termination of the Intercolonial railway, *Rivière du Loup*, much farther down, being the original termination; *St. Henri*, near the city of Montreal, and *Sorel*, at the mouth of the Richelieu, both thriving towns. *St. Johns*, on the Sorel, is also a thriving town. On the line of the Grand Trunk railway are the cities *St. Hyacinthe* and *Richmond*—at the junction of the Quebec branch of the Grand Trunk,—and the towns *Sherbrooke*, *Lennoxville*, and *Coaticook*—all having important manufactures, and all thriving, active places.

18. Commercial Routes.—The Grand Trunk, Intercolonial, and North Shore Railroads, are the great railroads of Quebec. From Montreal another railroad runs south into the United States, and still another, south-east, to Portland; a perfect network traverses the Eastern Townships.

19. Inhabitants.—According to the census of 1881 there were 1,073,820 of the inhabitants of French descent, 81,515 of English, 54,923 of Scotch, and 123,749 of Irish. Of these 1,170,718 were Roman Catholics, and 188,309 Protestants. In some parts of the province there is a strong infusion of Indian blood in the inhabitants. The English-speaking portion of the population is found in the larger cities and in the eastern townships.

There were also 7,515 Indians in the province, settled chiefly at the villages of Caughnawaga and St. Regis, and at reservations in Two Mountains, Montcalm, Yamaska, and Laprairie counties.

These have, to a greater or less degree, adopted the customs of civilized life, living in frame houses, cultivating the ground to some extent, and making trifling ornamental articles for sale. They have some churches of their own, and some schools.





FIG. 53.—SCENES IN NEW BRUNSWICK.

PROVINCE OF NEW BRUNSWICK.

1. **Extent.**—New Brunswick, one of the “Maritime Provinces,” is rectangular in shape, and has an area of 27,174 square miles, with a length of 210 miles and a breadth of 180 miles. Its boundaries are: on the north, Quebec, the Restigouche river, and Bay of Chaleur; on the east, the Gulf of St. Lawrence and Northumberland Strait; on the south, the Bay of Fundy, Chignecto Bay, and Nova Scotia; on the west, the United States.

2. **Geological Features.**—New Brunswick has one of the most remarkable geological features of the continent. An area of carboniferous rock, containing one of the thickest and most extensive deposits of coal in the world, begins at Miscou Island, off the mouth of the Bay of Chaleur, its western boundary running in a direct south-westerly course to the latitude of about $45^{\circ} 30'$; the southern boundary runs directly east from this point through Cape Breton Island to the Atlantic. This area, containing nearly 10,000 square miles, “resembles a gigantic letter V,” enclosing within its arms the lower Gulf of St. Lawrence and Prince Edward Island. It is

thought that the same rocks underlie the southern and eastern Gulf of St. Lawrence, for Prince Edward Island belongs, in the main, to the same series, which reappears in the Magdalen Islands and Newfoundland.

West of the carboniferous lies a broad, parallel belt of palæozoic rock (Cambrian), traversed throughout its whole length by an irregular band of granite, and in its northern part containing two belts of metamorphic rock, all the north-west of the province being occupied by other palæozoic strata (Silurian).

Along the Bay of Fundy is a metamorphic belt containing small areas of granite and of all the palæozoic rocks. New Brunswick is within the Appalachian system, and consequently its elevated ridges run parallel to the chief ridge. These are, the palæozoic and granitic ridge west of the carboniferous area, and the smaller one near the southern coast. The former is the main watershed of the province, the rivers west of it draining off into the St. John, those to the east, in part into the Gulf of St. Lawrence and in part into the St.

John. The granitic country, as well as a great deal of the metamorphic country along the Bay of Fundy, is rough, hilly, and unproductive; but the elevations are nowhere more than 1,500 feet above sea-level. The great carboniferous area is level or gently undulating, and, for the most part, fertile. The finest land is found in the alluvial intervals, islands, and old terraces that abound along the rivers, especially the St. John and its affluents.

3. **Minerals.**—The mineral resources of New Brunswick are extensive and varied, but, as in Ontario, mining is still in its infancy. *Coal* (bituminous, or "soft,") occurs in various parts of the province,—near Bathurst, Newcastle, Richibucto, Buctouche—but the only place yet discovered in which it is found in workable quantity is at the head of Grand Lake. This district is a source of large local supply and of export. *Bituminous Shales*—slate-like rocks, from which oil is obtained by distillation, are found in Albert and Westmoreland counties.* *Gypsum* (sulphate of lime) is very abundant, the deposits being large and of a pure quality. It is found chiefly in Albert, King's, Westmoreland, and Victoria counties. The chief mines are in Albert, at Hillsborough, where the beds are about sixty feet thick. *Freestone*, an easily worked sandstone for building purposes, is abundant in the west, but is quarried chiefly in Gloucester, in Albert, and Westmoreland counties; *Grindstones* are largely exported from the same quarries. *Red Granite*, of a fine quality for building or ornamental purposes, is largely quarried in Charlotte county; it is rapidly superseding, in the Dominion, the famous "Peterhead" granite of Scotland, to which it is fully equal in beauty.

Limestone is abundant in south-eastern New Brunswick; but the best is found in the metamorphic rocks of the Bay of Fundy coast. *Manganese*, used in bleaching and glass-making, is found in various places—near Bathurst, and in St. John and Albert counties.

All the minerals referred to above, except granite, are found in the carboniferous area of New Brunswick.

Iron is found in the Silurian belt of rocks near Woodstock, Carleton county, and in York county; it is mined but little. *Copper* is found on the south coast, but not

in workable quantity. Some *Gold* also is found in the Silurian belt. *Galena* (ore of lead) is found in Carleton county and elsewhere, but is mined only to a limited degree. *Antimony* occurs in York county, and is mined to a considerable extent. *Plumbago*, though found in the metamorphic region in the west, has been mined only near St. John.

4. **Outline.**—The outline of New Brunswick, though regular on the whole, presents a number of locally important irregularities, valuable in coast traffic as harbors or landmarks.

Capes.—The most important capes met with in coast traffic are: on the east, *Point Miscou* (mis-co), *Point du Chêne* (shane), and cape *Tormentine*; on the south, cape *Speneer* and *Point Lepreau* (le-prô).

5. **Islands.**—The islands are few and not important—*Miscou* and *Shippegan* (gán) on the north-east, and *Grand Manan* (ma-nán) and *Campobello* in the south-west, are the chief—all valuable as fishing grounds, the number of herring taken around the last two, in drift-nets and weirs, being enormous. All along the eastern coast there are very many long, narrow islands of drift-sand, dangerous to navigation.

6. **Coast Waters.**—These are highly important, for they surround New Brunswick on three sides, and are connected with large rivers that extend far into the country, bringing almost every part of the province in contact with ocean navigation; but, above all, the innumerable little bays, curves, and shallows along the coasts, afford feeding and spawning grounds for myriads of fish, the taking of which is one of the two chief industries of the province.

Bay of Chaleur (shal-uf), or Bay Chaleur, forming more than half the northern boundary of the province, is said to be without shoal or reef; its waters are cold, like those of the Gulf north of the Magdalen Islands. The fisheries are very important, consisting of salmon, cod, herring, mackerel, and lobster; the value of the catch of 1883, as reported to the Dominion Government, being \$656,000. The bays on the east are *Miramichi* (mere-â-mě-shée), *Shediac* (shay-de-ác), and *Verte*; on the south, the *Bay of Fundy* and its offshoots, *Passamaquoddy* and *Chignecto* (shig-néc-to), branches of the latter being *Shepody* (shép-o-dě) and *Cumberland*. It is in the upper part of this latter bay that the tides rise so

* The *Albertite*—a black, hard mineral, regarded as "a variety of asphalt, originally fluid like petroleum, and derived from the decomposition of vegetable or animal products," is found in Albert, King's, and Westmoreland counties, but the mines formerly worked at Hillsborough and elsewhere have become completely exhausted.

high; scarcely less high are the tides in Shepody bay, while in both, the tide at low water runs off for miles, leaving bare vast mud-flats, which at high water are feeding grounds for fish. (See Part I., "Ocean," sec 15, 16.)

7. **Rivers.**—The rivers of New Brunswick are provincially important in the two chief industries; though, excepting the St. John, they are not large, even provincially, yet their lower waters are deep, and they can be navigated for relatively long distances. Unlike the rivers of Ontario and Quebec, they have, as a rule, no falls, the geological structure of the country, here as elsewhere, determining the character of the rivers. The tide water reaches a comparatively long way up each, and they thus become valuable for their fisheries; at the same time their numerous affluents afford means of transporting to the coast the products of the forests in the interior. On the east the rivers are most numerous; on the south the metamorphic hills skirting the coast throw the water into the basin of the St. John, the one river of prime importance.

The *St. John*, about 500 miles long, is in many respects a remarkable river. Its head waters are in the main axis of the Appalachian range, in the county of Dorchester, Quebec, near the parallel of 46°. It follows the trend of the mountains to the Little Falls; thence to its mouth it runs irregularly south-east. Its upper basin includes nearly all the country bounded by the parallels of 46° and 48°, the Appalachian axis, and the Silurian belt. Across the latter the basin is very narrow, but it expands again on reaching the carboniferous area, into a cup-like depression occupying all south-central New Brunswick. The basin is thus relatively very large, and the volume of water consequently great.

The river, instead of running parallel to the Appalachian ridges, runs nearly at right angles across them; throughout a large part of its course it is bordered by hills on both sides, often close to it, rising 200 or 300 feet above the surface of the water. Along these hills, and on the tops of the lower ones, river-terraces and other beds of gravelly material are frequently met with, showing that the river had once occupied a much higher level, and that it has worn out its valley and channel to its present position. In other places the ancient bed has been filled up by the glacial drift, and the river has been turned from its course into new channels, the Grand Falls resulting from one of these deflections. This

fact, in the opinion of geologists, shows that the river has existed from palæozoic times.

St. John harbor, several miles wide at its entrance, affords shelter in its outer portion from all winds but the south. Where the harbor narrows to the river a small rocky island rises some fifty feet out of water, beyond which is the inner harbor—deep, but not very capacious, sheltered from all winds. The approach to the upper part, at the city itself, is somewhat dangerous, the channel being rather narrow and lying between a bar and a rocky shallow. A mile beyond the city the river passes between two perpendicular cliffs 300 feet apart, causing a phenomenon of rare occurrence—a tidal waterfall. The narrowness of the gorge will not allow the water to pass through rapidly enough to preserve the level, above and below; hence, when the tide in the harbor is low, there is a fall outward of the water from above, and when the tide is high in the harbor, there is a fall inward. At "half-tide," during both rise and fall, the water is at a level in the gorge, and vessels can pass through for about half-an-hour. Sometimes, when there is a heavy freshet in the river, there is scarcely any fall upward, and then, at low-tide in the harbor, the rapids above the gorge are as wild as those above the falls at Niagara.

The intervals, or alluvial meadows and islands, first met with about thirty miles up the river, are often only a few inches above water level, and so are flooded during freshets, the higher ones only at very great freshets. The crop on the low intervals is grass; on the others, grass and grain. Many of the larger ones are covered with a dense, heavy forest growth of hardwood—elm predominating. Only the highest intervals have any dwellings on them. About 225 miles from the mouth occur the Grand Falls, 74 feet high. To this point the river is navigable for light craft, except during the period of lowest water, larger ones ascending to Fredericton, 85 miles from the mouth. Above the Grand Falls there is a stretch of 40 miles of navigable water to the Little Falls, at Edmonton, near the mouth of the Madawaska.

The scenery along the St. John is among the finest in Canada, whether the river runs between ridges of bold hills, through gorges like those near St. John and the Grand Falls, or amid the low alluvial islands, that are fringed to the water's edge with dense shrubbery.

The other important rivers of New Brunswick are the *Restigouche* (res-tě-goósh), famous for its salmon; the *Miramichi*, 225 miles long, navigable for river vessels for about 100 miles, and for large vessels over twenty-five miles. Its affluents are very numerous, and spread out over a wide area, starting in the Silurian belt. Across the mouth of the bay stretch a number of islands of drift-sand. The fisheries of the river are very valuable; and large quantities of timber are brought down to tide water, which extends about fifty miles into the river. Besides these are the *Richibucto* (rish-ě-búck-to), *Petitcodiac* (pet-ě-co-de-ác), and the *St. Croix* (croy)—the only river that has falls in its lower course. Important affluents of the St. John, are the *St. Francis*, *Madawaska*, *Tobique* (toe-béek), *Aroostook*, *Nashwauk*, *Oromocto*—which forms some shoals in the main river—*Washademoak*, and *Kennebecasis*.

8. **Lakes.**—These are numerous in the Silurian regions, and are formed by the blocking up of depressions by the glacial drift. The chain of the *Cheputneti* lakes, drained by the St. Croix, are the most

important; in the carboniferous area the chief are *Oromocto* and *Grand Lake*, the latter draining into the St. John through the deep, sluggish little river Jemseg.

9. *Climate*.—Owing to its maritime situation, New Brunswick has a climate less subject to extremes than the climate of Ontario. The mean winter temperature in the coast regions is much higher than that of Ontario in the same latitude, but the summer temperature is lower; in the interior the tendency is more to extremes, being colder than on the coast in winter and warmer in summer.

As in all the Alleghany region, the rainfall is abundant in summer, and the snow, away from the coast, deep in winter. The springs are tedious and disagreeable, the coasts, and for some distance inland, being often buried in fog; but the summer and fall are clear and pleasant. The winters are not so clear and dry as those of Ontario, and the spring opens somewhat later than in the south western part of the latter province.

10. *Vegetation*.—The fruits and grains of New Brunswick are those of Ontario and Quebec. The forest growth is similar to that of eastern Quebec, the predominant trees being of the pine family, viz., white pine, spruce, and hemlock; the hardwoods being chiefly birch, elm, maple, and beech.

11. *Industries*.—The chief industries of New Brunswick are connected with *fishing* and *lumbering*. The value of the former in 1883, according to government reports, was nearly \$3,200,000; one county, Charlotte, catching fish to the value of \$1,335,000. The fishing is carried on almost wholly in open boats, and in nets and weirs along shore. Comparatively few vessels are fitted out for deep-water fishing on the banks of Newfoundland, or elsewhere, at a distance from shore.

The lumber trade is still the great industry. Sawmills abound along the rivers, the larger ones being within reach of river boats, which in their turn transfer the sawn lumber to ocean-going vessels. Pine is becoming scarce and more difficult of access,—spruce lumber, in the shape of deal, being the chief kind exported. Great Britain takes by far the larger part of the lumber and timber.

Agriculture is not yet a leading commercial pursuit, the chief articles exported being horses, sheep, hay, and potatoes. Cattle are exported to some extent from Westmorland county by the way of Halifax.

The farm produce does not suffice for home consumption, considerable quantities of provisions,—bread-stuffs and salted meats especially,—being imported from Ontario, Quebec, and elsewhere. The farming country is chiefly in the south-east, and along the valley of the St. John.

Manufactures are not numerous, but they are important. In addition to the various preparations of lumber and fish for market, there are large cotton and woollen factories, sugar refineries, foundries, engine works, boot and shoe factories, ship yards, tanneries, etc.

Shipping is extensive, both in the number and size of the vessels built and owned, and in the number of men employed in navigation. (See Appendix I. (o) and (p) for Industrial Statistics.)

12. *Trade*.—The export trade of the province is largely connected with the two main industries—the forest and the fisheries. (See Appendix I. (q).)

13. *Education* is well provided for by means of Common, Superior, and Normal Schools, supported in much the same way as in Ontario. A Superintendent of Education, Board of Education, and County Inspectors carry out the system of education. A provincial university is established at Fredericton, and denominational colleges at Sackville and Memramcook, Westmorland county.

14. *Subdivisions*.—There are fifteen counties in New Brunswick, subdivided into parishes. The system of government, though local, is not the same as in Ontario.

15. *Cities*.—*Fredericton* (population 6,218 in 1881), the capital, a neat, pretty little town, is situated on the St. John, 85 miles from its mouth, at the head of navigation for larger river boats. The exports are all in connection with forest produce. There are several large sawmills in the vicinity. The Parliament Buildings, University, and Normal School are the chief public buildings.

The site of the city is low, alluvial ground, river-sand or clay being everywhere not more than a foot from the surface. A low hill at the rear of the city shows at its base the former channel of the river.

St. John (population 26,127 in 1881; with Portland, 41,353) is finely situated for trade and manufacture. The harbor is well sheltered, and never blocked with ice, the strong current carrying all the ice of the river out to sea.

Fuel is near and abundant, and of superior quality for manufacturing purposes. Raw material from other countries can be brought cheaply in vessels to the city itself, while the ocean and river water-ways, together with railways reaching all points, afford excellent opportunity for distribution of manufactures. Though the city's commerce as yet depends mainly upon the vast quantities of lumber and timber coming down the river, and upon the fisheries, yet the development of the mineral and agricultural resources of the upper country, and the advantageous situation in every point of view of the city itself, must ultimately make St. John far larger and more important, in both the province and the Dominion, than it is at present.

In number, tonnage, and size of vessels owned, St. John is said to rank the fourth city in the British Empire, being surpassed only by Liverpool, London, and Glasgow; the number and excellence of ships and barques owned in St. John is especially remarkable. (See Appendix I. (g).)

In addition to the preparation of lumber, there is extensive ship-building and manufacture of engines, machinery, castings, edged tools, saws, hardware, nails, agricultural implements, cotton and woollen goods, boots and shoes, leather, paper, lime, etc. The iron works and rolling mills are said to be the finest in Canada.

The city is very compactly built on a rounded tongue of slate rock, between the harbor and a little offshoot called Courtenay Bay that runs bare at low water. Hills and high ground surround the city on the north and west. The houses are mainly of brick, but there are numerous fine stone residences and warehouses. Many of the churches are in the best style of architecture, and all the government buildings are handsome, substantial structures—the post-office, custom-house, hospitals, etc. On the opposite side of the river is Carleton, a part of the city, with fine residences on the hills in the back-ground; while *Portland*, a separate city, containing 15,226 inhabitants in 1881, is continuous with St. John and should be considered a part of it. In 1877 a fire destroyed nearly half of the city, including all the business quarter; but though it was soon almost wholly rebuilt it has not yet recovered from the disaster. Property to the value of over \$25,000,000 was destroyed, and the city lost by removal several thousand inhabitants.

The city presents a fine appearance on being approached from the water; but the view opposite the falls, from the hills of Carleton, is not equalled even by the view from Montreal mountain or the citadel of Quebec.

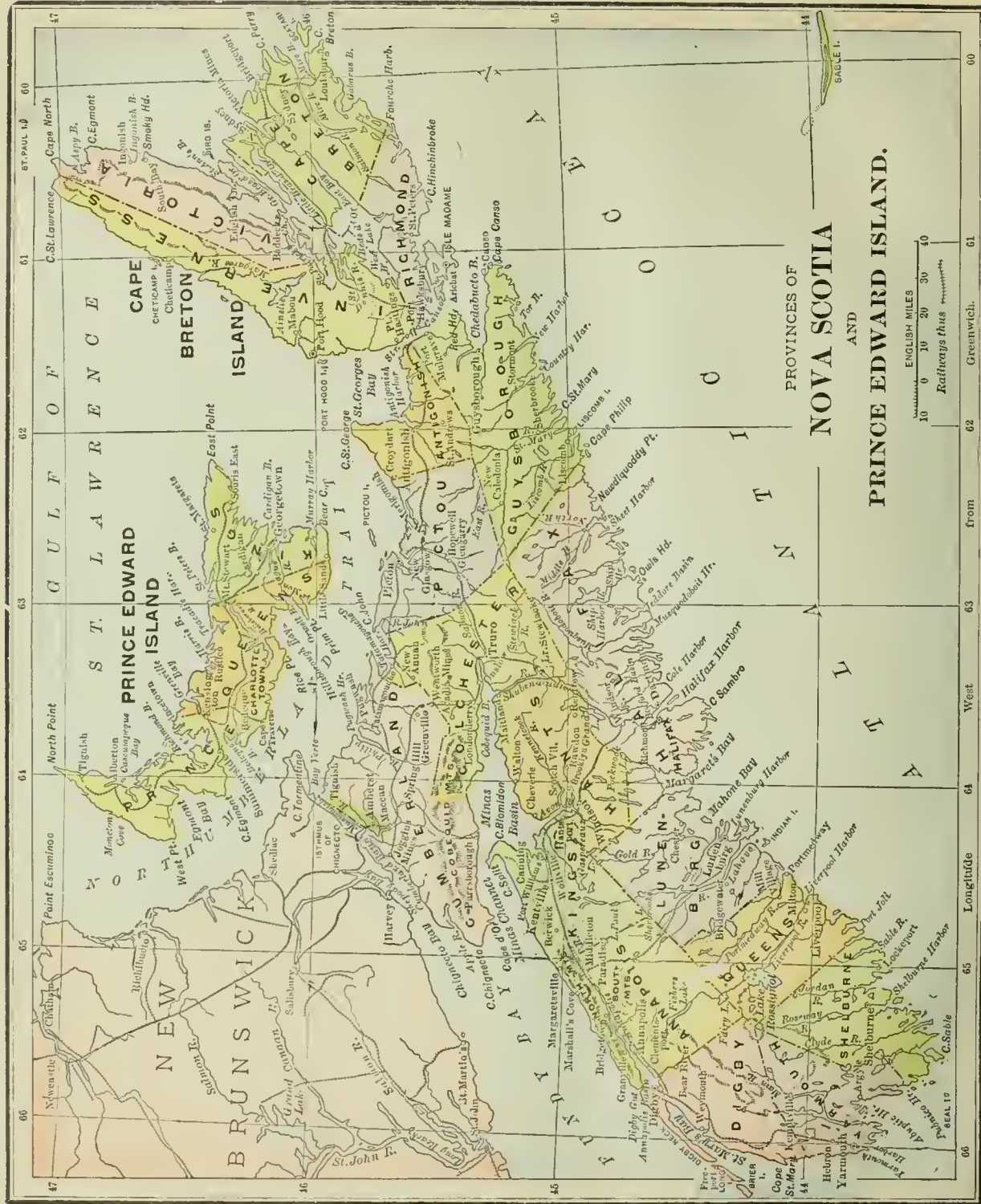
St. Stephen, an active town at the head of deep-water navigation of the *St. Croix*, and *St. Andrews*, at the mouth of the same river, are engaged in the lumber trade and fisheries chiefly. *Maryville*, near Fredericton, contains very large saw mills, and the largest cotton and

knitted-goods factories in the Dominion. *Woodstock*, 65 miles above Fredericton, on the *St. John*, is in a fertile region of the Silurian belt; in addition to the lumber trade, it has a manufactory of extract of tan-bark, and there are iron mines in the vicinity. *Edmonton*, 265 miles above St. John, is a growing town. *Sackville*, at the head of Cumberland Bay, is in a fine farming and stock raising country; its extensive dyked marshes, the finest land in the province, produce large quantities of hay and grain. Mount Allison College and Female Academy are situated here. *Moncton*, a fast rising town, on the *Petitecodiac*, is the headquarters of the Intercolonial Railway, and has the railway workshops; it contains also a large sugar refinery. *Shediac*, *Richibucto*, *Chatham*, *Newcastle*, on the east coast, and *Bathurst* on the north, have large trade in lumber and fish,—lobsters and oysters forming an important part of the fish-exports from the first three. Ship-building is also carried on, especially at Chatham.

16. Commercial Routes.—New Brunswick has suffered from lack of railways to open up the country. The Intercolonial, and *St. John and Maine* (from St. John to Portland) are mainly for passenger traffic. The New Brunswick and Canada (to Edmonton and thence, perhaps, to *Trois Pistoles*) tends to open up the western part of the province. Another, that will be of great advantage in this respect, is being constructed from Fredericton to Chatham, through the centre of the province.

17. Inhabitants.—New Brunswick was part of ancient "Acadie," and was originally settled by the French, whose descendants still form the bulk of the population on the upper St. John, and a very large portion of the inhabitants in the east and north—in all about 57,000. The early English settlers were Loyalists, from New York mainly, who came to St. John in 1783, founded the city, and had land given them in the neighborhood and up the river. The population was 321,233 in 1881.

18. The Government is like that of Quebec, having both a Legislative Assembly and a Legislative Council.



NOVA SCOTIA AND PRINCE EDWARD ISLAND.

ENGLISH MILES
0 10 20 30 40
Nautical Miles
0 10 20 30 40

Longitude

West

64

63

from

62

Greenwich.

61

60



FIG. 54.—SCENES IN NOVA SCOTIA

PROVINCE OF NOVA SCOTIA.

1. **Extent.**—Nova Scotia, including the peninsula proper and the island of Cape Breton, stretches north-east and south-west from about latitude $43\frac{1}{2}^{\circ}$ to latitude 47° , and from about longitude $59\frac{3}{4}^{\circ}$ to $66\frac{1}{2}^{\circ}$.

Its southern part is, therefore, in the latitude of Toronto, and its northern part in that of Lake Superior. Its breadth is nearly uniform throughout the greater part of its extent, while the salt water is not more than thirty miles distant from any one point. Excepting where the province joins New Brunswick, the sea and its offshoots form the entire boundary. The area is 20,907 square miles.

2. **Geological Features.**—Nova Scotia is merely a short, low, and broadened subsidiary terminal ridge of the Alleghany system; it nowhere reaches 1,200 feet above the sea-level.

There are two ranges in the province: one, the highest, called the Cobequid (*cob'-kid*), consisting of palæozoic (Silurian) and Laurentian rock, extends, with some breaks, from Cape Chignecto through Cape Breton

Island and into Newfoundland, forming the watershed of the northern and eastern part of the peninsula; the other, consisting for the most part of a broad granitic belt, begins with the southern extremity of the province, and, after running directly north nearly to the Bay of Fundy, curves to the east till it reaches the Avon river. From this point it continues as a narrow, and for the most part uninterrupted, band to Cape Canso. The broad part of this belt, which lies nearer one side than the other, forms the watershed of the western part of the province.

The rock through which the granite protrudes, and which occupies all the Atlantic seaboard for half the breadth of the province, is the oldest of the palæozoic rocks (Cambrian); while all north of the Cobequid ridge, nearly all of Cape Breton except the northern peninsula, and a considerable area south of Minas Basin and Cobequid Bay, are occupied by the important carboniferous series of rocks. In these lie the best coal mines of Canada. (See "New Brunswick," sec. 2.) Other palæozoic rocks, older than these last, are found in different

places. Along the whole length of the south shore of the Bay of Fundy, a distance of 125 miles, extends a ridge of trap-rock, nowhere more than four miles wide or more than 600 feet high, terminating in its north-eastern extremity by the bold bluff, Cape Blomidon, fully 500 feet high, and in its south-western extremity by Brier Island. The characteristic trappean slope is here toward the Bay of Fundy, the shores of which, from Blomidon to the Annapolis Gut, are cliffs often over 200 feet high, kept perpendicular by the disintegrating power of frost, and by the unceasing action of the waves.

The narrow valley of red sandstone (triassic), never over twelve miles wide, between this ridge and the ridge called the South Mountain formed by the granitic belt and some Silurian deposits, is the finest and most fertile part of Nova Scotia—the Cornwallis and Annapolis valley.

3. Minerals.—Nova Scotia stands out prominently as the leading mining province of the Dominion, surpassed by British Columbia in production of gold, but of no other mineral; its products of the mine are greater than those of Ontario and Quebec combined.

Although but three or four minerals are systematically mined, yet the surveys conducted by the government geological corps, though limited hitherto, tend to show the existence of rich deposits of many others of great economical importance.*

Coal.—That part of the carboniferous formation, the “middle coal measures,” that contains all or nearly all the workable seams of coal, is largely developed in Nova Scotia, extending from Cumberland Basin, at the head of Chignecto Bay, directly east through Pictou and into Richmond and Cape Breton counties, in Cape Breton Island.

In Cape Breton the chief mines are at and near Sydney, the coal area stretching from Mira Bay to Cape Dauphin, and sinking under the Atlantic, where they are capable of yielding, it is estimated, 1,866,000,000 tons of coal. On the mainland the chief mines are at Pictou and New Glasgow;—in the Albion Mines at the latter place a coal seam attains the extraordinary thickness of thirty-six feet. The mines in Cumberland county are situated at Spring Hill and vicinity, and at the “Joggins” on the shore near the mouth of Cumberland Basin. Other mines exist in Richmond and Inverness counties, and in Antigonish.

The total amount of coal raised from the mines in 1883 was nearly 1,600,000 tons.

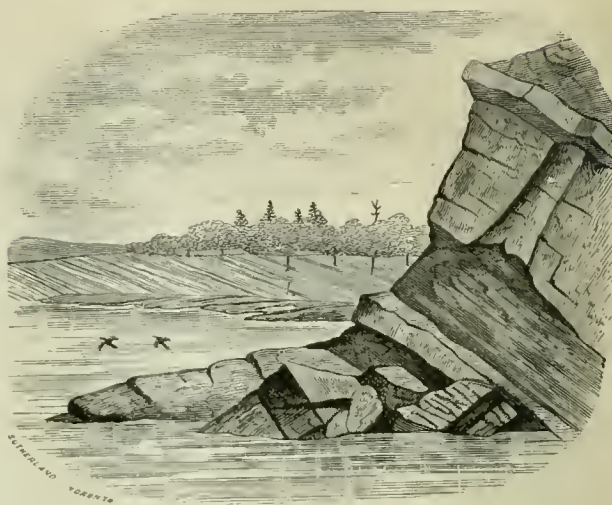


FIG. 55.—UPRIGHT FOSSIL TREE.

Gold.—The gold region of Nova Scotia comprises the palæozoic (Cambrian) belt of the Atlantic coast, and the crystalline area in northern Cape Breton. Upwards of fifty mines are in operation at present (1886). The area of the gold-bearing rocks is estimated at over 6,000 square miles.

Iron.—Iron is found mainly in the Silurian and crystalline area of the Cobequids, in similar rocks at Nictaux in Annapolis county, in Cape Breton, and to some extent in the trappean range and the carboniferous area. Systematic survey will, doubtless, show that it exists everywhere in the Silurian and Metamorphic rocks. An important fact is the existence of iron near the coal deposits in Pictou county; indeed, coal is here nowhere very far remote from iron. Only one mine has been extensively worked,—that near Londonderry, Colchester county.

Gypsum.—The deposits of gypsum are very extensive in Nova Scotia. They occur chiefly in the carboniferous area. The beds are extensive, and vary in thickness from a few inches to 120 feet.

“The deposits of gypsum in Nova Scotia are on an unequalled scale. The beds are frequently traceable for miles by exposures, presenting faces fifty feet in thickness. In Antigonish it occurs on St. George’s Bay as a crystalline cliff two hundred feet high; and similar exposures are met at Plaster Cove, Mabou, and many places on the Bras d’Or.”

* Hitherto accident or display of ores, along water-courses or on hill-sides, has alone shown the existence of minerals. The application of science to this important subject is needed almost as badly here as in Ontario.

Gypsum, when ground, is extensively used as a fertilizer, and when calcined, forms plaster of Paris, so largely employed for architectural purposes.

It is exported chiefly from Windsor and the vicinity.

Limestone is everywhere in the carboniferous area, and is quarried extensively.

Other minerals, though existing widely, are mined but little; these are *lead* and *copper*, both found in all the geological formations,—*manganese*, *arsenic*, some *silver*, *zinc*, *tin*, *nickel*, and *plumbago*. Grindstone and whetstone grits are found along Cumberland Basin and vicinity, and fine building stone (sandstone and granite) "is afforded by every harbor from Pictou to Amherst."

4. **Outline.**—Taken as a whole, the outline of Nova Scotia is quite regular; the northern part, from Bay Verte to Cape St. Lawrence, in Cape Breton, is a curve with but one break; the Atlantic shore extends in a tolerably straight line north-east and south west, one break occurring between Cape Breton and the main land, and another about midway between the extremities of the latter; the west Atlantic shore rounds off regularly, while the trappean shore of the Bay of Fundy is absolutely uniform, no break occurring. The termination of the trappean North Mountain, and of the Cobequid ridge at the head of the Bay of Fundy, gives rise to a very irregular outline in that district.

In relative extent of coast line, Nova Scotia is surpassed only by the British Islands.

5. **Isthmuses.**—The broad isthmus of *Chignecto*, between Bay Verte and Cumberland Basin, connects Nova Scotia and New Brunswick. *St. Peter's* isthmus connects the two peninsulas forming Cape Breton Island; it is only about half a-mile wide, and is intersected by a canal that connects Bras d'Or Lake and St. Peter's Bay.

6. **Peninsulas** are somewhat numerous in Nova Scotia. Cape Breton Island consists of two peninsulas; the central granitic ridge is prolonged into the Atlantic at the eastern extremity of the mainland; the trappean North Mountain extends, in the south-west, into the Atlantic, in a long, narrow neck, called Digby Neck, while the Cobequid ridge, projecting into the Bay of Fundy, makes a broad peninsula of the western part of Cumberland county. Numerous small projections line the Atlantic coast.

7. **Capes** are as numerous as peninsulas. The chief are *Cape North*, at the northern extremity of Cape Breton;

Enfumé to the south of this, over 2,000 feet high, the highest point in the province; *Canso*, terminating the granite ridge in the north-east; *Sambro*, near the entrance to Halifax harbor; *Sable*, on Cape Sable Island at the southern extremity; *Chignecto*, the western termination of the Cobequid ridge; *Cape Split*, a shivered trappean headland at the entrance to Minas Basin; and *Blomidon*, a perpendicular basaltic bluff, rising out of a cliff of red sandstone, and overlooking Minas Basin.

8. **Islands.**—The islands are innumerable, but, with a few exceptions, are of little importance. They all lie near the shore, and, for the most part, are rocky. Off the south-western extremity of the province, a region of conflicting and changeable currents, tidal and others, lie a number of low islands composed of drift sand deposited by the currents. Both currents and islands are a source of danger to navigation in these waters.

Apart from Cape Breton, the principal island of the province is *Isle Madame*, a fertile and populous island south of Cape Breton. Next in importance is *Boularderie*, lying between the two peninsulas of Cape Breton. Others are *Pictou* island in the north, *Cape Sable* island in the south-west, and *Long* island and *Brier* island, portions of the North Mountain, severed from the ridge by deep passages of water. (For *Sable Island*, see "Canada," sec. 6.)

9. **Coast Waters.**—The innumerable little arms of the sea on the Atlantic sea-board, are the natural accompaniment of the islands and peninsulas: they are the water-filled depressions on a rocky mountain slope. These inlets large and small, beside being, for the most part, good harbors open all the year, are the feeding and spawning grounds of multitudes of fish, and are thus the cause of Nova Scotia's greatest industry. Only the inlets from the Bay of Fundy and those of Cape Breton are important commercially; these stretch far inland, and thus bring a large part of the country in contact with navigable water.

The tides of the Atlantic and Gulf coasts are not of great height, but those of the Bay of Fundy and its offshoots vary from fifty feet at Cape Chignecto, to seventy at Amherst.

Along the greater part of the shores of the offshoots of the Bay of Fundy, mud-covered flats of alluvial land, often miles in extent, are laid bare at low water. At the mouths of the rivers entering these offshoots the flats are higher, and are overflowed only during spring tides; in consequence of this they are covered with a thick growth of salt grass. Many of these marshes have been "dyked in" and converted into soil of inexhaustible fertility. The Tantramar Marsh, ten miles broad, between Amherst and Sackville, N.B., belonging mainly to New Brunswick, and the Grand Pré, between the Avon and the Cornwallis rivers, are the most important. A similar dyked marsh runs for many miles up the Annapolis river.

The most important coast waters are:—on the north, *Bay Verte*, *Pictou Harbor*, *St. George's Bay*; in Cape Breton, *Bras d'Or Lake*—a broad expansion of two narrow inlets called Great Bras d'Or and Little

Bras d'Or,—*Sydney Harbor*, *St. Peter's Bay*; on the Atlantic coast, *Chedabucto Bay*—connected with *St. George's Bay* by the Strait, or "Gut," of Canso, a mile and a-half wide,—*Halifax Harbor*, one of the finest harbors in the world. This harbor is about eight miles long and from one to three miles broad, narrowing at the city of Halifax, but expanding again into the beautiful *Bedford Basin*, as long as the harbor itself and much broader. The harbor is perfectly safe in all weathers, and only rarely does it freeze over at the city, and then but temporarily. Other bays are *Margaret's Bay*, *Mahone Bay*, *Port Medway*, *Yarmouth Harbor*, and *St. Mary's Bay*.

The Bay of Fundy coast is wholly without natural harbors, except the *Annapolis Basin*. This beautiful sheet of water may be regarded as the deepening and expanding of the lower part of the Annapolis river before it burst through the trappean ridge into the Bay of Fundy. The passage—called Digby Gut—that the river has made through this ridge, is about two miles long, and from a-half to three-quarters of a mile wide, between almost perpendicular cliffs. The Basin is a mine of wealth in its fisheries; vast quantities of herring and other fish are taken in it every year. *Minas Channel* expands into *Minas Basin* and *Cobequid Bay*, the latter running almost dry at low tide. The waters of these and of *Chignecto Bay* and *Cumberland Basin*—especially the last—are very turbid, owing to the disturbance of the sediment at the bottom by the rapid currents of the rising and falling tides. (For the Bay of Fundy, see Part I., "Ocean," sec. 15, and "Canada," sec. 8.)

10. **Rivers.**—The conformation of the country prevents the existence in Nova Scotia of rivers commercially important. Those connected with the waters of the Bay of Fundy, all narrow and winding,—the *Annapolis*, *Cornwallis*, *Avon*, *Shubenacadie*, and *Truro*,—contain from forty to fifty feet of water at high tide, but run dry, excepting a little stream of fresh water, at low tide. The *Annapolis* can be ascended by schooners for twenty miles; the others, for only four or five. The *East River* of Pictou, the *St. Marys* of Guysboro, and the *Tusket* of Yarmouth, are the largest of the other rivers.

11. **Lakes** are numerous in the Cambrian area of the Atlantic coast, but they are not important. The largest are lakes *Rossignol*, in Queen's county, and *Ship Harbor*, in Halifax county.

12. **Climate.**—The climate of Nova Scotia is like that of New Brunswick, saving that there is not so great a tendency to extremes. It is more temperate than that of any other province of the Dominion, western British Columbia excepted. Nova Scotia is one of the healthiest countries in America.

13. **Vegetation.**—The forest growth is that of New Brunswick, showing, on the whole, a somewhat more northern character than that of New Brunswick. All the ordinary grains and roots are grown. Of fruits, the apples of Nova Scotia, especially of King's and Annapolis counties, rank highest in the English market. Pears and plums are abundant, but grapes rarely ripen in the open air.

14. **Industries.**—At the head of the industries of Nova Scotia stand the *Fisheries*, carried on mainly by the Atlantic counties, Lunenburg and Digby being the chief. The value of the exports of the fisheries is greater than that of similar exports from all the rest of the Dominion together; while the value of the fish caught forms nearly half the value of those taken in the whole Dominion.

Lumbering is the industry next in importance. As with the fisheries, so with the lumber—the Atlantic counties produce the most, Cumberland, however, exporting very largely also. Spruce is the chief kind of wood, followed by birch and maple, pine being comparatively scarce.

Agriculture is the chief industry of the counties other than those of the Atlantic sea-board,—in other words, of the counties in which granite is absent, and the strata are other than of the Cambrian series.

The carboniferous counties are the chief grain-growing ones, wheat and oats being the chief grains. The sandstone (*Triassic*, see Fig. 2) counties, Annapolis and King's, produce over two-thirds of the fruit, while the latter and Colchester—its part sandstone—produce the largest root crops.

Stock-raising in Nova Scotia is carried on extensively.

Mining.—(See sec. 3, above.)

Manufactures.—Nova Scotia has few manufactures as yet, but its extensive deposits of coal and iron, so near together, will undoubtedly make it some day the manufacturing centre of Canada. The chief articles manufactured are, ships, refined sugar, leather, boots and shoes, iron, machinery of various kinds, and preserved foods. Hants, King's, Yarmouth, and Lunenburg are the chief ship-building counties.

Shipping.—"In proportion to its population Nova Scotia has more shipping than any other country." But the ships of Nova Scotia are for the most part engaged in the foreign carrying trade. (See Appendix I. (r) for statistics of industries.)

15. **Trade.**—The trade with the United States, as the nearest market, is extensive; that with the West Indies is also large. Breadstuffs and manufactured goods of all kinds come in large quantities from Ontario and Quebec; excepting coal and some fish, but little of Nova Scotia's productions find their way to the inland provinces; even

coal goes no farther than Montreal. (See Appendix I. (r).)

16. **Education** is well provided for by means of public, or common schools, and "county academies,"—the latter receiving an extra grant from government. The means of support are about the same as in Ontario,—partly local, partly provincial. A chief superintendent and county inspectors control the system. A Normal and a Model School are established at Truro, and a Provincial University (Dalhousie College) at Halifax. There are also denominational colleges—*Acadia* (Baptist), at Wolfville, *King's* (Church of England), at Windsor, *St. Francis Xavier* (Roman Catholic), at Antigonish.

17. **Subdivisions.**—There are eighteen counties in Nova Scotia, subdivided into townships, and governed much the same as in Ontario.

18. **Cities.**—*Halifax* (population 36,100 in 1881; present estimate 43,000), the only city in Nova Scotia, is situated some seven miles from the mouth of Halifax harbor, upon a tongue of land between the harbor proper and the "North-West Arm." Its position is favorable for foreign commerce, but as the agricultural counties have a seaboard of their own, their export and import trade with the United States and the Dominion have comparatively little connection with the capital, and the country in the neighborhood of the city is not agricultural. The Intercolonial and the Windsor and Annapolis railways, which terminate here, bring some traffic to the city, but of the articles brought the greater part is for provincial use. The upper provinces have ports of their own. In winter, however, considerable export trade from the other provinces passes through Halifax.

A considerable amount of the products of the fisheries, and to some extent those of the forest, are exported from Halifax. But the import trade with the West Indies and Europe is extensive, and the Intercolonial carries a great deal of foreign freight to the upper provinces. Owing to its excellent situation for foreign trade and home distribution, and to the presence of coal and iron in its near neighborhood, Halifax should become the first manufacturing city in Canada.

Its manufactures are at present limited, the chief being boots and shoes, furniture, clothing, and malt liquors. There are, however, a large cotton-mill and a sugar-refinery.

Halifax derives considerable importance from the fact that it is the only place in the Dominion where the Imperial government maintains a garrison. It is also the summer station of the North American Squadron. Large quantities of military stores are kept in the citadel and in the Imperial Dock Yard. Both the city and the harbor are strongly fortified.

Halifax is not a broad city. It lies for the most part at the base and along the side of the spur that forms the tongue of land projecting into the harbor. The highest point of this ridge, near the centre of the city, is occupied by the citadel, one of the strongest fortifications in America, and commanding the whole harbor. The extremity of the tongue of land is now a large public park, with fine picturesque drives. Between this and "Citadel Hill" are most of the principal residences of the city, some of the finest, however, being along the "North-West Arm." In the same district lie the horticultural gardens, an attractive feature of the city. Halifax has all the natural facilities for becoming one of the most popular of summer resorts. (See Appendix I. (t).)

19. **Towns.**—The towns of Nova Scotia differ from those of Ontario in that they have little or no manufacturing. They owe their importance, which is mainly local, to the mines in their vicinity, or to their possession of a good harbor.

Yarmouth (population about 7,000), owns more shipping proportionally than any other town in the world, the vessels being remarkable for their large size and excellent workmanship. Its industries are almost altogether connected with the sea—fishing, ship-building, navigation, and some manufacture of rigging, canvas, etc.; woollen cloth is also manufactured. It is the most active town in the province.

Lunenburg (population over 4,000) is the next most important ship-building town, and the most important for its fisheries.

Windsor, on the Avon river, in a fine agricultural country, has almost all the trade in gypsum. It has also some shipping. *Pictou*, on Pictou harbor, is the port for shipping coal from the New Glasgow and other mines. It has also considerable shipping and trade in fish. *Sydney*, in Cape Breton, exports more coal than any other town in Nova Scotia. *Dartmouth*, opposite Halifax, has foundries and a sugar refinery. Agricultural towns, each with some manufactures, are *Amherst* (pop. 4,500), at the head of Cumberland Basin; *Truro*, at the head of Cobequid Bay, containing the Normal and Model Schools; *Antigonish*, on an inlet from George's Bay, on the north-east coast, contains St. Francis Xavier College. *Annapolis*, at the head of Annapolis Basin, more important in the early history of the province than it is at present, has steamboat connection with St. John and Boston, and ships a great deal of fruit to England. *Digby* is a pretty little town, a summer resort, at the lower end of Annapolis Basin. *Liverpool* ships large quantities of lumber, as do many other little towns on the same coast.

20. **The Commercial Routes** are mainly the surrounding waters; but beside the *Intercolonial* railway, which has a branch from Truro to Pictou, there are the *Windsor and Annapolis*, which connects Halifax with Annapolis; the *Western Counties*, between Digby and Yarmouth; the *Eastern*, from Truro to Gut of Canso; another, connecting the Spring Hill coal mines and Parrsboro'; and one not yet completed, from Nictaux iron mines, in the upper Annapolis valley, to the Atlantic.

21. The Inhabitants numbered 440,572 in 1881. Descendants of the *Highland Scotch* constitute almost all the population of Cape Breton and of Antigonish, Pictou, and Colchester counties, the language and many of the manners and customs of their forefathers still surviving, especially in Cape Breton and Antigonish. *French Acadians* are numerous in Digby, Yarmouth, Richmond, and Inverness counties. They are found also in considerable numbers in Halifax and Antigonish counties. Lunenburg county is largely peopled by the descendants of the discharged *German* soldiers who were in the employ of the British government in the war with the revolted colonies, and who were granted land here at the close of the war. Elsewhere the people are mainly of *English* descent, Halifax containing very many *Irish*.

22. The Government is like that of New Brunswick.

PRINCE EDWARD ISLAND.

1. *Extent, etc.*—Prince Edward Island lies in the southern part of the Gulf of St. Lawrence, extending in a crescent shape between latitude 46° and 47° , and longitude 62° and $64\frac{1}{2}^{\circ}$. It is about 130 miles in length and 35 miles in extreme breadth, its area being 2,133 square miles.

2. *Geological Features.*—As a rule the island is level, or at most slightly undulating, except near the middle, where the country is quite broken, and hills 400 feet high are met with. The shores are for the most part steep, owing to the action of the water upon the soft, red sandstone rock of which the island is almost wholly composed. The strata seem to belong to a transition period, between the Palæozoic (Carboniferous) and the Mesozoic (Trias) formations. The soil is fertile and easily cultivated.

3. *Minerals*—The strata of this province have as yet yielded no economic minerals. It is thought, however, by geologists, that the Carboniferous coal-bearing strata which are known to dip beneath the water on the Nova Scotia shore, and which the red sandstone overlies, may be reached by boring to no very great depth, and that workable seams of coal may yet be found, especially in the southern part of the island. Traces of gold have been met with on the west coast, but it is not known how rich the deposits may be.

4. *Outline.*—The outline of the island is very broken, more especially on the south side, the soft, coarse-grained rock not being able to resist the action of the waves and the ice. In consequence, projections of the land are

numerous. *East Cape*, *West Cape*, and *North Cape* are the extremes of the island, while *Cape Traverse*, on the south, is the nearest point to the mainland, nine miles distant.

5. *Islands.*—These are few and wholly unimportant. With the exception of *Governor Island*, near Charlottetown, they are all on the north, and consist of long, low stretches of sand, or sandstone, broken through in one solitary spot by a mass of volcanic trap.

6. *Coast Waters.*—Prince Edward Island is surrounded by shallow water, either because the depression of the strata under the water is nowhere great, or because of the deposition of sediment derived from the wasting away of the shores. These shallow waters, as in the other maritime provinces, are the feeding-grounds of valuable food fishes.

In winter ice fills these waters, and though Northumberland Strait, nine miles wide at its narrowest part, is never frozen across, yet the ice is often packed so thick and close that the government steamer sometimes finds very great difficulty in forcing a way through it. On such occasions communication is made with New Brunswick by an open boat which is dragged over the places where the ice is compact. The ice does not fill the strait till late in December. Navigation opens early in April. Occasionally heavy ice strands on the north shore, delaying the arrival of warm weather.

The indentations are numerous, one, *Hillsborough Bay*, on the south, nearly severs the island, the isthmus left being about five miles wide. *Richmond Bay* is of a similar character on the north side, opposite which, on the south side, is *Egmont Bay*; while *Cardigan Bay* lies at the east end of the island.

7. *Climate.*—The climate of Prince Edward Island is as equable as that of Nova Scotia, and is in marked contrast with that of the parts of Ontario—the regions north of Lake Huron and around Lake Nipissing—in the same latitude as the island. The fall season is longer than on the mainland, but the springs are somewhat tedious, for the surrounding waters, which become thoroughly chilled in the latter part of winter and filled with floating ice, do not warm up again so readily as does a wide stretch of land. Fogs are not common, for there is no conflict between cold and warm masses of water, and consequently of air, in the southern Gulf of St. Lawrence as there is in the Atlantic in the same latitudes. The summer and fall are very pleasant seasons. The July isotherm of 70° crosses southern Ontario, but it falls much below Prince Edward Island, while the January isotherm of 22° crosses both, southern Ontario being over two hundred miles farther south.

8. *Vegetation.*—All the ordinary grains and fruits (except peaches and grapes) grow well and give excellent

crops. The sandy loam soil is especially well adapted for root crops and oats.

Forest growth is wholly of the northern type—spruce and fir being the prevailing trees; but maple, beech, birch, hemlock, cedar, tamarack, and poplar are abundant.

9. **Industries.**—As might be inferred, *farming*, in its various branches, is the chief industry, the farm produce exported being mainly potatoes and oats, both in large quantities. Stock-raising is fast becoming a leading pursuit.

The *fisheries* are the next most important industry, the value of the catch in 1882 having been nearly \$2,000,000. Fishing is pursued almost exclusively along the coast, but few vessels going to the deep sea.

The chief fish taken are cod, mackerel, herring, lobsters, and oysters.

The *forest* industry is relatively much less important than that of any other wood-producing province.

The *manufactures* are for the most part for home use, only a few being for exportation. Of the latter the chief are preserved meats and other articles of food, starch, and ships. (See Appendix I. (u).)

10. The **Trade** of the province consists mainly in the exportation of the products of the farm and the fisheries, and the importation of goods similar to those imported into the Dominion at large. (See Appendix I. (v).)

11. **Education** is provided for by means of Public and Grammar (or High) Schools, and by a Normal and a Model School. There are two colleges, Prince of Wales and St. Dunstan, the latter belonging to the Roman Catholics.

12. **Subdivisions.**—There are three counties in the island, each enclosing one of the three chief bays.

13. **Cities and Towns.**—The capital, *Charlottetown* (population, 11,485 in 1881; present estimate, 15,000), is a pretty little city on a fine harbor in Hillsborough Bay. Its trade is relatively important. In 1883, 180 vessels, British and foreign, entered at the port.

The city is built a little back from the water, at no great elevation above it. It is very open and airy, the streets being remarkably wide, the whole presenting a very pleasing appearance. There are some fine buildings, the Legislative Buildings being the principal.

Summerside (population about 3,000), on Bedeque (*bě-děk*) Harbor, is next in importance to Charlottetown. These two ports do by far the greater part of the produce trade of the island. At both, the shallowness of the water necessitates the building out from the shore of long wharves, at which vessels may discharge or take in cargo.

Georgetown, on Cardigan Bay in the east, is the other chief port. It has some trade in produce and fish.

Many of the little villages, especially on the northern coast, have of late become places of summer resort, Ontario furnishing a large portion of the visitors, sea-bathing and fishing being the chief attractions. *Rustico* is the chief of these summer resorts.

14. **Commercial Routes.**—As in Nova Scotia, the sea is the chief highway; but a railroad runs in a very irregular course from *Tignish*, in the north-west, to *Souris*, in the north-east, both important fishing villages; branches extend to Georgetown and other places.

15. The **Inhabitants** are the same as those of the other maritime provinces. Of a population of 108,891 in 1881, nearly a half were of Scotch descent; a fifth, English; nearly a quarter, Irish; and about a tenth, French.



FIG. 56.—COD-FISHING.

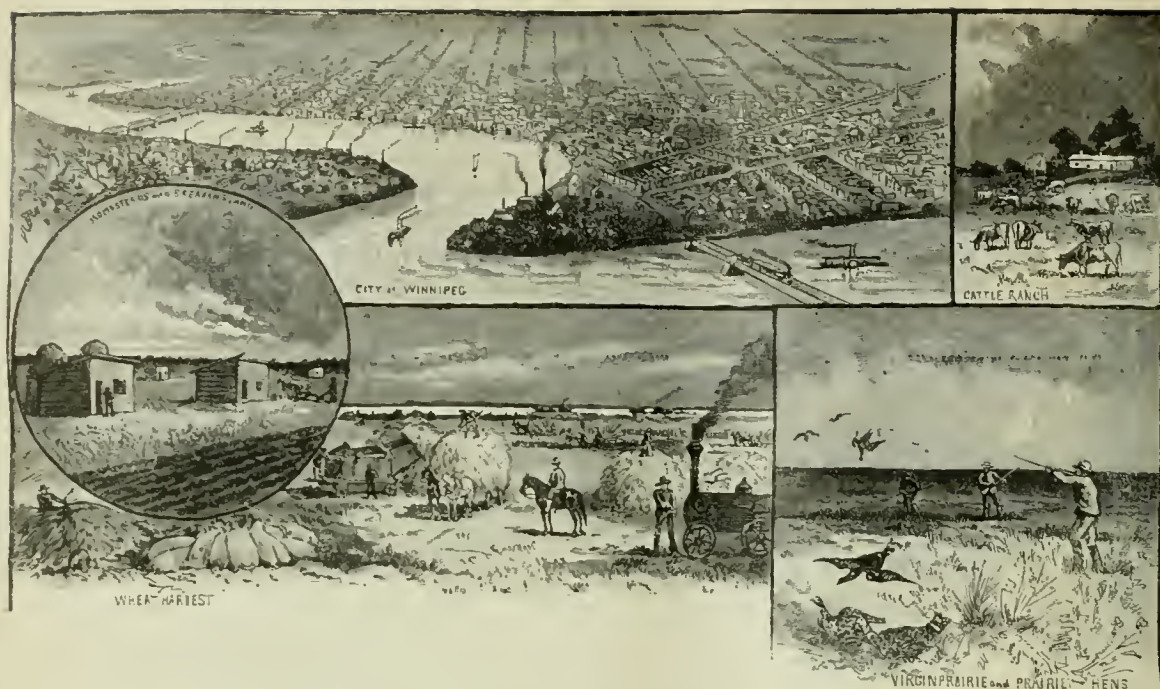


FIG 57.—SCENES IN THE NORTH-WEST.

MANITOBA AND THE NORTH-WEST.

1 Geological Features.—The “North-West” consists of two distinct regions. The first, the great Archaean (Laurentian and Huronian) area, bounded on the west by a chain of lakes extending almost to the Arctic, is a rugged country for the most part, undoubtedly abounding in useful minerals, as this formation does elsewhere; it is well-wooded, filled with endless winding streams and chains of lakes, the waters of which reach Hudson Bay or the larger lakes, over innumerable falls, rapids, and “chutes.”

West of this, but of totally different geological structure, lies the second region,—the great prairie, extending to the Rocky Mountains. (See “Canada,” sec. 2).

At its southern end this region is about 750 miles wide, but as the eastern boundary trends more decidedly north-west than does the western boundary, the plain narrows rapidly till at the north it is only between 300 and 400 miles wide. North of the parallel of fifty-four it is no longer strictly a prairie, but becomes covered more or less thickly with forest growth.

The Rocky Mountains, which form the western boundary of this plain, are fringed with foot-hills everywhere except in the neighborhood of the forty-ninth parallel. There the mountains rise almost abruptly from the plain, reaching their highest elevation between the parallels of 51° and 52°.

North of the fifty-fourth parallel the whole plain dips north-westerly; south of that parallel it dips north-easterly, the descent being about five and a half feet in a mile, the lowest level, about 700 feet in elevation, being reached in the Manitoba lake-region. But the descent is by no means uniform.

The lowest area, somewhat over fifty miles wide, with an average height of about 800 feet, is bounded on the west by an almost abrupt rise in level, marked by a series of hills—the Pembina Mountain, Riding and Duck Mountains, the Porcupine Hills in Manitoba, and the Basquia and other hills beyond—running in a general north-westerly course. From the peculiar fine, soft, alluvial nature of the soil of the southern part of this

region, and from appearances around its southern edge (two hundred miles south of the international boundary) and elsewhere, it has been inferred that this area was once a great lake, the outlet of which was into the Mississippi. It nowhere shows marked effects of the action of running water or other denuding agents. It is a region of great fertility, the richness of the alluvium being further increased by the accumulations from decayed or burnt vegetable matter.

Beyond the boundary the next area reaches a height of about 1,600 feet, and extends westward for two hundred and fifty miles, when another rise occurs, the level beyond being two thousand feet above the sea at the rise, and four thousand feet at the base of the Rocky Mountains. The rise, called the *Great Coteau*, is a broken, rough region, extending parallel to the first rise. This level is more deeply trenched and more diversified than the lowest level, a condition caused by much longer exposure to denuding agencies. The last level, four hundred and sixty-five miles broad, has a more varied surface than the other two; it is much more elevated, and has been acted on by eroding agents to a greater extent both before and since the glacial period. It contains high hills or little plateaus, such as Cypress Hills and Wood Mountain, and "the universal denudation that has taken place is evidenced by the size and depth of the valleys of rivers and streams, the great ravines and 'coulées,' (*coo-lâys*, i. e., *water-courses*) which have been cut and are still extending themselves in the soft sandstones and clays, and the isolated plateaus and 'buttes' (single, abrupt mountains) which now stand far out on the plains of lower level." All this region is better adapted for grazing than for tillage, though there are large tracts of excellent soil, which need only sufficient moisture to make them highly productive. (See "North America," sec. 14).

The rocks that underlie the middle and western sections of the plain are not Palæozoic, like those of all the region between this plain and the Atlantic; they are Mesozoic (chiefly Cretaceous), the disintegration of which produces a warm, rich soil.

In some places, especially in Assiniboia near the Coteau de Missouri, are stretches of land made comparatively unproductive by the presence of a good deal of alkali; but it has been shown that these lands too can be wholly reclaimed by the use of manure. Consider-

able alkali exists in the surface soil throughout the whole of the prairie country.

2. **Minerals.**—The minerals yet known are few; the Laurentian area probably is everywhere characterized by the same minerals as in the older provinces. *Lignite*, as has been stated before, ("Canada" sec. 3), occurs extensively on the Souris River; in the Cypress Hills, and near Moose Jaw and Medicine Hat in Assiniboia, on the line of the Canadian Pacific Railway; along the Bow and Belly Rivers, and near Edmonton in Alberta; and also along the Athabasca and Peace Rivers in Athabasca. It is mined at Medicine Hat, on the Bow River, and near Moose Jaw. *Petroleum* is known to exist on the Athabasca and elsewhere.

3. **Rivers.**—A low watershed crosses the plains in the neighborhood of the forty-ninth parallel; from the Rocky Mountains east to the hundred and fourth meridian, where the Coteau de Missouri (Great Coteau) crosses the international boundary, the watershed is on the Canadian side, the rivers draining off into the Missouri, or its affluent, the *Milk River*; east of that meridian the watershed crosses into the United States, and by a deep curve gives rise to the upper part of the valley of the *Red River*.

Between this watershed and the fifty-fourth parallel lies a valley, or rather system of valleys, separated in the western part by very low and dispersed elevations, but in the eastern, meeting in two valleys, those of the lower *Saskatchewan* and the *Assiniboine*. In the middle region of the great plain the rivers "now flow with uniform though often swift currents, in wide trough-like valleys excavated in the soft material of the plains, and frequently depressed from one hundred to three hundred feet below the general surface. In these valleys the comparatively insignificant streams wander from side to side in tortuous channels, which they leave only at times of flood."

The principal river is the *Saskatchewan*, the main stream being formed by the union of two others, the *North* and the *South Saskatchewan*, both rising in the Rocky Mountains. This river is navigable from the rapids at its outlet into Lake Winnipeg, to Edmonton on the northern branch near the foot of the mountains; the principal affluent of the northern stream is the *Battle River*; the southern branch is formed by the union of the *Bow* and *Belly* rivers.

The *Assiniboine* starts near the parallel of 52°, and runs close to the eastern side of the second prairie level, somewhat east of south to about the parallel of 50°, when its course is easterly to the *Red River*. Its southern affluent is the *Souris*, the western the *Qu'Appelle* (*ca pél*), which starts with the western boundary

of the second prairie level, and runs through a fine agricultural country.

The *Nelson*, a thoroughly characteristic Laurentian river, about 360 miles long, carries all the waters of these rivers, with those of the *Red*, into Hudson Bay.

In the east, beyond the parallel of 54°, the *Churchill*, most of the water of which gathers from the Laurentian area, is almost a succession of innumerable lakes, but with fewer rapids and falls than the *Nelson*; in the west the *Mackenzie* carries off into the Arctic the waters of the *Liard*, *Peace*, and *Athabasca*, together with those of the chain of great lakes along the edge of the Laurentian area. Other rivers of smaller size exist in large numbers, but can be of little importance at any time except as canoe routes during summer.

4. **Climate.**—The climate throughout the prairie regions resembles that of Manitoba; but in the south-western part, in the Bow River country, it is milder in winter, so much so that cattle, if properly cared for, can live through the season without shelter. Warm winds,



FIG. 28.—A PRAIRIE HERD.

called the Chinook winds, often come down from the mountains, producing a rapid rise in temperature. Elsewhere, and here too, at times, the terrible "blizzards" occur—furious, intensely cold winds, carrying with them snow blown to the finest dust, that penetrates everywhere, produces smarting pains wherever it strikes the body, and packs as hard as the hardest ice. No human life can hold out long against such storms.

5. **Vegetation.**—In no part of the plain regions is forest growth wholly absent except in the south-west; even there many of the river courses, or "coulées," are full of trees; elsewhere clumps of trees are frequently met with along the streams, or in low places. (See "Canada," sec. 12.)

6. **Political Divisions.**—Except in the case of Manitoba, the political divisions of the region between Ontario and Hudson Bay on the east and the mountains on the west, have not yet received provincial governments.

North of Manitoba, and stretching to the Arctic is the district of *Keewatin*, wholly Laurentian in character. West of Manitoba and Keewatin lie *Assiniboia* and *Saskatchewan*, the

parallel of 52° separating them. In the latter is *Battleford*, formerly the seat of government, the chief place being *Prince Albert*, a rapidly increasing town at the junction of the two *Saskatchewan*s; in the former, *Regina*, the seat of government for the North-West. West of these lies *Alberta*, with *Edmonton* on the North *Saskatchewan*, and *Calgary* on the Canadian Pacific Railway as the chief places; north of Alberta is the district of *Athabasca*. Elsewhere the territory, called the *North-West Territory*, has no political organization. The Hudson Bay Company have trading posts, called "forts," at many places in all these territories, the chief being *Yerk Factory* on Hudson Bay, at the mouth of the *Nelson*. The trade, which is with the Indians for furs, once very important, is rapidly becoming less.

The islands and coast waters of the north are wholly unimportant, politically and commercially.

East of Manitoba and north of Ontario lies the *Northern Territory*, Laurentian like *Keewatin*. (See Labrador for *North-East Territory*).

MANITOBA.

1. **Extent.**—Manitoba extends from the international boundary northward to latitude 53°, westward to the meridian of 101° 30', and eastward to 91° 10', the south-eastern boundary being coterminous with that of north-western Ontario. It occupies all of the first division of the western plain, while its southern portion extends over nearly the whole of the second division; the eastern part of the province is in the Laurentian area.

2. **Geological Features.**—Underlying the alluvial or glacial deposits of the lowest depression of the plain, are limestone rocks of the later Palaeozoic (Devonian) formation; these are seen along the banks of rivers and lakes, in nearly horizontal beds. The country, therefore, not having been affected by denudation, and with horizontal underlying strata, is level. Around the lakes, especially where rivers enter them, the land is low and flat, often swampy.

3. **Rivers.**—The *Red River*, the valley of which begins 200 miles south of the international boundary, is the chief stream of the province. It flows between banks eroded from the prairie, and still widening slowly, the water in consequence being charged with sediment; at the places where the limestone rock occurs along its banks, the breadth is less than elsewhere. The river is not deep, and in dry seasons is not navigable in the southern part of the province; in wet seasons it often overflows its banks and produces destructive floods.

The *Winnipeg River*, the outlet of the Lake of the Woods, is a characteristic Laurentian river, consisting of little lakes, and numerous waterfalls and rapids, with stretches of quiet water between them. Its scenery is most beautiful.

4. **Lakes.**—The great lakes of Manitoba, all connected, are *Winnipeg*, *Manitoba*, and *Winnipegosis*; the

first is by far the largest, being 272 miles long, sixty at its greatest breadth, (one mile at the narrowest portion), but only from fifty to sixty feet deep; the others are much smaller. The outlet for these lakes is the Nelson River, which reaches the Hudson Bay through the depression of the Laurentian area.

5. Climate.—The climate of Manitoba is excessive. The mean temperature from 1871 to 1881 was 33°.06 (Fahrenheit); the mean highest temperature was 95°.34; the mean lowest - 40°.51. The hottest month is July. The summer temperature, from the middle of May to the middle of September, sometimes sinks below freezing point; in 1881, 31° on May 20th, and 27° on September 15th, the maximum on these days being respectively 82°.7 and 55°.7, while from the middle of November to the first of March the minimum temperature of by far the greater number of days was below zero, ranging from 1° to - 40°.5.

The mean rainfall from 1871 to 1881 was about seventeen inches, ranging from over twenty-four inches in 1878 to a little more than eight in 1881; the snow in the same period averaging nearly fifty-three inches.

The spring months and the late fall months are the driest; as a rule most rain falls in the latter part of May and in June. (See sec. 4, also "Canada" sec. 11.)

The Red River opens for navigation in the latter part of April, and closes early in November.*

6. Vegetation.—Forest growth in south-western Manitoba is confined to the banks of streams,—a clump of woods on the prairie marks the presence of water; the trees are poplar, elm, ash, basswood, and some oak. Along the lakes and in the Laurentian region the forest

is almost continuous, and pine, spruce, and other northern trees are found.

All the ordinary grains grow well and yield a high average per acre, but early frost sometimes damages the wheat; potatoes and root crops yield excellently; orchard fruits have yet to be tested.

7. Industries.—The only industry as yet,—one rapidly increasing in magnitude, and even now important commercially,—is grain-raising; stock-raising will soon be added to this. There is no lumbering except a little on Lake Manitoba and the other lakes. Neither mining nor manufacturing can be said to have begun.

8. Education is provided for much as in the older

provinces. There are several colleges and higher schools. The government has but one legislative body, as in Ontario. The inhabitants of Manitoba, as of all the districts, are from the different races of older Canada, with, however, more Indians and half-breeds than elsewhere.

9. Cities and Towns.—Winnipeg, the capital, is situated at the confluence of the Red and Assiniboine riv-



FIG. 59.—INDIAN ENCAMPMENT.

ers, and is the distributing point to all the regions west. In 1870 it had a population of 250; 7,985 in 1881; the present estimate being 35,000. The city has all the modern improvements. There are many fine buildings, both public and private; among the former are the University of Manitoba and St. John's College. The situation is low, rendering drainage difficult and exposing the city to inundation.

There are many other towns growing up rapidly in important places; chief of these is *Portage la Prairie* on the Assiniboine, where several factories have been started. Others are *Emerson*, near the border, on Red River; *St. Boniface*, opposite Winnipeg; *Selkirk*, below Winnipeg on the Red River; and *Brandon* on the Assiniboine, west of Portage la Prairie.

*The above has been compiled from the published reports for 1883.



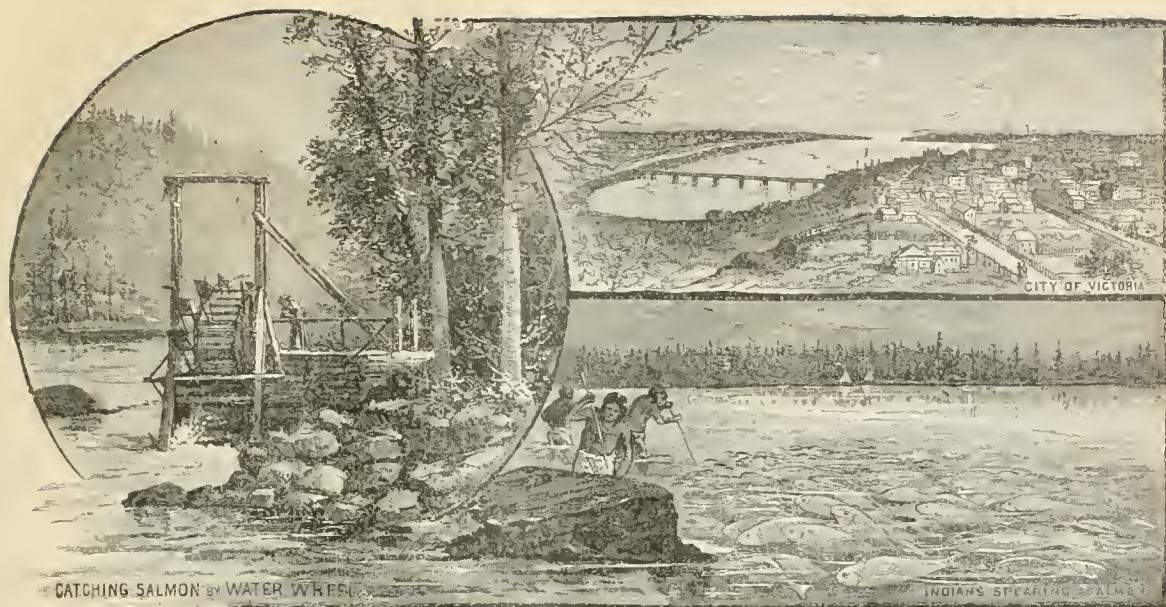


FIG. 60.—SCENES IN BRITISH COLUMBIA.

BRITISH COLUMBIA.

1. **Extent.**—The boundaries of British Columbia are—on the north, the parallel of 60° ; on the west, the Pacific Ocean and the frontier of the United States Territory of Alaska; on the south, the parallel of 49° —the international boundary;—and on the east, the Rocky Mountains and the meridian of 120° . Vancouver Island extends south beyond the 49th parallel. The area of the province is 341,305 square miles.

This mountain province has an average breadth of about 400 miles, the mountain mass being much narrower than it is farther south; beyond the fifty-sixth parallel little is really known of the country.

2. **Geological Features.**—There are four chief ranges, the *Rocky*, the *Gold*, the *Coast*, and the *Vancouver* mountains, running parallel in a north-west and south-east direction. In the Rocky Mountains the loftiest peaks are in the southern portion; the highest, Mount Murchison, near the parallel of 52° , has an elevation of about 13,500 feet. Glaciers are met with among these higher summits. Passes through narrow valleys are

numerous and of various elevations, from 2,000 feet at the Peace River Valley in the north, to 7,100 at the South Kootenay pass in the south; the Canadian Pacific Railroad crosses by the Kicking Horse Pass, 5,300 feet high. The strata of this region are almost wholly of limestone of the later Palaeozoic times.

Between this range and the Gold range lies a long, straight, and wide valley, known to extend from the international boundary fully seven hundred miles northward.

The mountains composing the Gold series consist of several subordinate ranges—the *Purcell*, *Selkirk*, and *Columbia* toward the south, and the *Cariboo* toward the north. Some of the peaks are over 8,000 feet high. A very large portion of the region, regarded as the oldest of the Rocky Mountains group, is composed of crystalline rocks with areas of granite.

Westward to the Coast ranges—often, but improperly, called the *Cascade* mountains—extends a plateau averaging a hundred miles in width, and having a mean

elevation of about 3,500 feet, but descending to the sea in its south-western part. In places it is nearly level and uniform in character, but usually it is rugged and hilly. It contains the chief pasture and agricultural lands of the province. Trappean and other volcanic rocks cover much of this district.

To the west of this plateau are the rugged Coast ranges, composed mainly of crystalline and granitic rocks, some of the peaks reaching an elevation of 9,000 feet. Glaciers are found among them, especially in the north. As these mountains descend to the water, very numerous and deep narrow inlets are met with.

The Vancouver range, extending through Vancouver and Queen Charlotte Islands, is a detached, water-surrounded subsidiary range of the great system of the mainland, the highest elevation being about 7,500 feet; these islands are therefore quite elevated in character, though considerable areas are plateaus. As on the mainland, the shores are everywhere indented with narrow, deep reaches of water bordered by perpendicular walls of rock of a dizzy height.

3. **Minerals.**—The mineral wealth of the province, as yet in a great measure undeveloped, forms its chief



FIG. 61.—GOLD WASHING.

resource, and is the centre around which the main industries cluster. Gold is found throughout the province, the main belt of auriferous rock running just inside

the Rocky Mountains and including the districts known as Kootenay, Cariboo, Omineca, and Cassiar. From 1858 to 1882 the gold produced in British Columbia amounted to \$46,685,334, the greatest yield, \$3,745,850, being in 1864.

Coal deposits, important both in extent and value, are found on the mainland and in the islands. At Nanaimo is found bituminous coal of a quality specially adapted for ocean steamships, and superior to that of any other on the Pacific coast. The chief market for it is San Francisco, where it is in great demand. At Comox, still further north, the deposits occupy a wide area. Large fields of *Lignite* exist near New Westminster, in the Nicola Valley, and along the North Thompson and Skeena rivers. *Anthracite* coal beds are found in Queen Charlotte Islands. Over 150,000 tons of coal are annually exported.

Iron ore in great masses is found on Texada Island, situated in the Gulf of Georgia, in close proximity to the chief coal mines. Silver has been found near Hope on the Fraser River, at Yale, and in other localities. Copper occurs in various places both inland and on the coast, the most promising lode being one on Howe Sound.

4. **Outline.**—Viewed as a whole, British Columbia is compact and regular in outline; the deep, often long, inlets of the sea, with their towering perpendicular walls, are but the lower-lying valleys, or gorges, of the mountains, filled with sea-water; while their counterparts, high up from the sea-level, are the courses of rivers or the beds of lakes. They have in consequence but little effect on a general view of the outline of the province.

5. **Islands.**—It follows from the above facts that islands, peninsulas, and capes are innumerable. Of the former—Vancouver being regarded as an integral part of the province—the Queen Charlotte Islands are the largest—Graham, Moresby, and Prerost Islands being the chief of the group. They are little known as yet, but they are rugged, deeply indented on the coast, covered with a dense forest growth of spruce, hemlock, and yellow cedar; they have a very equable climate, snow falling on the hills, but rarely in the valleys; winter is a season of almost continuous rain and wind. Fish of all kinds are abundant; while coal of the best quality, and gold and other metals are known to exist. The other principal islands are not yet explored—Pitt, Banks, Princess

Royal. Texada, to the north of the mouth of the Fraser River, has coal mines.

6. **Coast Waters.**—These are as numerous as the islands. The chief ones between the mainland and Vancouver Island are *Queen Charlotte Sound* on the north, the *Gulf of Georgia* on the south-east, and *Juan de Fuca Strait* on the south; *Haro Strait* lies between San Juan Island and Vancouver. *Howe Sound*, *Jervis Inlet*, and *Bute Inlet* are the chief arms of the Strait of Georgia; *Hecate Strait* lies between the mainland and Queen Charlotte Islands farther north.

7. **Rivers.**—The rivers are numerous, and such as characterize a mountain region, — exceedingly devious in their course, often interlacing in appearance or reality; bending in sharp curves around the ends of ranges of hills, or cutting their way through them only to return in the same direction that they have come; winding between banks often hundreds of feet in perpendicular height, or tumbling in falls over cliffs; forming lakes or confined to a narrow channel, through which they must rush wildly;—such are all the rivers of British Columbia.

The *Fraser* starts in the valley west of the Rocky range in latitude 53° , follows the valley over a hundred miles north-west, sweeps round the end of the Cariboo mountains, and then runs south through the middle of the central plateau for 350 miles or more to the Gulf of Georgia; its chief affluent, the *Thompson*, starts in the southern Cariboo mountains and runs south-west. The *Peace* starts near where the Fraser makes its curve, and runs north into a low-lying and fertile region near the parallel of 56° , and then turns east and passes down the mountains to flow into Athabasca Lake. The *Columbia* starts in some lakes about latitude 50° , in the same valley as the Fraser, runs north-west for over 150 miles, curves sharply to the south, widens out into a long reach known as the Arrow Lakes, and crosses into the United States, where it bends south-west and goes on to the Pacific. The *Kootenay* in its head-waters overlaps the *Columbia*, but runs south-east till the end of the Purcell range is reached in the United States, when it curves north again, widens and deepens into Kootenay Lake, and then enters the Columbia. In the north is the *Skeena*; farther north, the *Stickeen* flows into Sumner Strait, above Fort Wrangel, in Alaska.

8. **Lakes** are innumerable, and of true mountain character—long, narrow, often also very irregular in

outline, and frequently very deep. Besides those named above the principal are *Okanagan*, discharging by a river of the same name into the Columbia, and *Shushwap* in the south; *Stuart*, *Tacla*, and *Babine* in the north.

9. **Climate.**—With its southern part situated nearly five hundred miles farther north than the southern point of Ontario, and extending over seven hundred and fifty miles still further north, British Columbia lies wholly within the cold temperate zone, its northern portion entering the sub-Arctic zone; in addition to this the greater part, exclusive of mountain peaks, is from 2,000 to 4,000 feet above sea-level. Such conditions would imply a rigorous climate. But one of the greatest agents in modifying the effects of elevation and of distance from the region of a perpendicular sun—oceanic winds from the tropics—produces here some of its most marked effects; and the varied character of the physical features makes a climate of equally varied character.

At Esquimalt, Vancouver Island, where the elevation is but slight, in the years 1874 and 1876 the lowest temperature recorded was 8° (Fahrenheit), the ordinary lowest temperature being about 20° , the highest, 83° ; at New Westminster, farther inland, the lowest was 7° , the highest, 92° ; in the interior on the central plateau of the Thompson River, in about latitude $50^{\circ}5'$, (760 feet above the sea) the lowest in 1874 was -29° , the highest, 98° . This latter, with some local variations, indicates the general climate of the southern half of the Province.

Within the same periods the rainfall at Esquimalt ranged from 17.65 inches in 1874 to 33.42 inches in 1875; at New Westminster, in six years the mean (rain and melted snow) was 59.66 inches; at Thompson River in 1875 it was only 11.84 inches, including melted snow. The dryness of the interior is due to the influence of the Coast Ranges; the ranges farther east are wet at their summits on the western side, but dry elsewhere. In the northern part of the Province moisture is generally prevalent; it is excessive everywhere on the coast. In general the temperature resembles that of eastern Canada, though the south-western district is decidedly warmer, especially in Vancouver Island. (See Part I. "Atmosphere," secs. 27-29; and Part II. "North

America," sec. 13).

10. **Vegetation.**—Forest growth is luxuriant wherever there is abundant moisture. The characteristic tree is the huge *Douglas pine*, often reaching 300 feet in height and measuring thirty feet in circumference, and



FIG. 62.—BIG TREES.

growing in dense, dark forests—a tree exceedingly valuable for masts, owing to its toughness; the *Menzies pine* is also very large. Besides several other varieties of pine—*red*, *white*, and *pitch pine*,—there are the *red cedar*, often 150 feet high, and 15 in diameter; the *yellow cedar*, *tamarack*, and *maple*; the *yew*, with wood of rose color; the *arbutus*, close-grained and heavy, like box-wood; and the *oak*, of large size. Many others are found, more or less valuable, some being confined to the coast alone. In the plateau regions forest growth is sparse; the country is a “rolling prairie,” covered with grass and affording excellent pasture.

All the grains of eastern Canada grow and yield fine crops.

11. Industries.—*Mining* is as yet the chief industry of the Province, but it is only now that gold is being sought for in the rock itself rather than in the alluvial deposits.

The *Fisheries* of British Columbia are among the richest in the world, and form the second great industry of the Province. All the gulfs, bays, rivers, and lakes swarm with fish. Chief among these, and forming almost the only export in fish, are the salmon, for which the Fraser is famous. On this river especially, and all along the coast, canning establishments are located, which afford employment for a considerable part of the population. In 1883 the value of the fisheries was given as \$1,644,615. Other varieties of fish are the oolachan, or candle fish, herring, cod, bass, flounder, skate, sole, halibut, and sturgeon. Great numbers of seals are annually caught off the coast. Oysters are found, though of an inferior quality. The whale fishery is carried on to some extent.

Lumbering, though capable of great development, is in its infancy; considerable quantities of timber, as logs and masts, are exported annually, some going even to Australia.

Agriculture.—The rugged and mountainous character of the country makes the agricultural areas comparatively small, far removed from each other, and difficult of access; the principal are the New Westminster district, the river valleys of the interior, and Queen Charlotte Islands. In the first, as well as in Vancouver Island, fruits grow to perfection. The valleys are covered with tall grass, and afford excellent ranges for cattle. In some parts of the southern interior irrigation is necessary. Through the diversity in soil and climate every fruit, cereal, vegetable, and flower peculiar to the temperate zone, can be grown in some region or another. There is as yet a lack of local markets and of shipping facilities.

In the Peace River region, though far north, there is a great extent of fine agricultural land; summer frosts, however, may do some damage at times.

There is but little *manufacturing*, except in connection with the preserving of fish and the preparation of lumber.

12. Trade.—The articles exported are gold, coal, fish and fish oils, furs, skins, and lumber.

13. Education is as carefully provided for as in eastern Canada, and in much the same way.

14. Inhabitants.—The population is about 60,000, and is of a mixed character, as in the other provinces; but there is also a large number of Chinese. The Indians are numerous, but of a more peaceful and industrious character than those of the east. The coast Indians, many of whom are in the employ of the proprietors of fish-canning and oil-extracting establishments, live almost altogether on fish. They are essentially maritime in their habits, and are skilled and fearless in the management of their well-built canoes. They live in independent village communities, often differing in dialect and customs from neighboring villages.

15. Commercial Routes.—

The *Canadian Pacific Railway* will aid greatly in the advancement of the province; it is the only commercial route to the east. From the Kicking Horse Pass, through which it crosses the Rocky Mountains, its route lies across the Selkirk and Gold ranges, and along the Thompson and Fraser rivers, to Vancouver, near the entrance to Burrard Inlet.

16. Cities and Towns.—*Victoria*, the chief city and capital, with a population of 5,925 in 1881 (present estimate 10,000), is a delightful place, and occupies a commanding commercial position at the south-eastern extremity of Vancouver Island.

Esquimalt, $3\frac{1}{2}$ miles distant from Victoria, possesses a magnificent harbour, and is the naval station for the British fleet in the North Pacific. *Nanaimo*, on the east coast of Vancouver, derives its importance as a shipping port from the vast deposits of bituminous coal in the vicinity. *New Westminster* on the Fraser River, the chief town on the mainland, has a population of nearly 5,000. It is the market of a flourishing agricultural district, and the seat of a large salmon-canning industry. *Burrard Inlet*, the principal harbour of the mainland, is the chief centre of the lumber trade. *Hope*, *Yale*, and *Lytton* are the most thriving villages in the interior. The great highway, leading north from Yale, is the Yale-Cariboo Wagon Road, over 400 miles in length; it extends north to the Cariboo mines, and was constructed at a cost of over \$500,000.

NEWFOUNDLAND.

1. **Position and Extent.**—Newfoundland,* the only British province in Northern America not belonging to the Dominion Confederation, is situated between the parallels of $46^{\circ}, 37'$ and $51^{\circ}, 39'$ north latitude, and the meridians $52^{\circ}, 37'$, and $59^{\circ}, 25'$ west longitude. Its greatest length from Cape Ray to Cape Bald is 317 miles; and the greatest breadth from Cape St. Francis to Cape Ray is 316 miles. Its area is about 42,000 square miles. In shape a rude isosceles triangle with the broad base to the Atlantic and the apex to the Gulf of St. Lawrence, this island is, as it were, a defence to the Gulf from the storms of the ocean, and a stepping stone from the New World to the Old,—for the distance from the eastern point of Newfoundland to Ireland is but 1,640 miles.

2. **Geological Features.**—Newfoundland constitutes the extreme north-eastern extension of the Appalachian system of mountains, the valley intervening between it and the rest of the system to the south-west being below the sea-level and covered with water; the direction of the ridges, the highest peaks of which are but little over two-thousand feet, is the same as that of the system in general. A continuous ridge, called *Long Range*, extends from Cape Ray to the extremity of the northern peninsula; another skirts the shore from Cape Anguille, north of Cape Ray, to the Humber; a third ridge, the *Middle Range*, crosses from Fortune Bay to Notre Dame Bay; a fourth, the *Black River Range*, crosses from Placentia Bay to the western side of Bonavista Bay, while in the Avalon peninsula there are two similar parallel ranges. Soon after rising from the waters to the south the island reaches its highest general elevation, varying from twelve to forty miles from the coast; thence the dip follows the direction of the ranges. The watersheds are formed by these different ridges.

Very little is yet definitely known of the interior of the island; but between the Long and the Middle ranges, and again to the east of the latter, there is an extensive undulating plateau containing a few ranges of low hills. In addition to these ranges there are a great number of isolated and sharp-peaked summits, called *Tolls*, rising from the plateau, some of them reaching 2,000 feet in height. There are also wide areas of savanna country—

*Almost the only pronunciation heard in the Maritime provinces is *Neuf n'land*.

level, meadow-like tracts, with a soil of fine black mould, forming rich pasture land; while around the head of every inlet, and along all the rivers are considerable areas of excellent agricultural land. The Random Sound island and district in Trinity Bay are especially fertile.

The strata include those ordinarily found in the Appalachians,—the *Paleozoic* of all the different formations, and the *Laurentian*. The latter seem to cover more than half of the island; they form the Long Range, the south-west of the island, the Grand Lake region and north-central part generally, and also occur in the south-east of the island; the *Huronian*, consisting here largely of sandstones, cover a large portion of the south-east, including most of the Avalon peninsula. Silurian strata are also largely developed.

Other crystalline rocks (particularly a species called *serpentine*), the same that in Canada and the United States are so important for their minerals, are met with over large areas,—all along the western and northern coasts, and between White and Bonavista Bays, where they extend far inland, and occupy nearly the entire basin of the Gander River, including the peninsula between Bay of Exploits and Bonavista Bay. The highly important *Carboniferous* rocks are found over a considerable area in the south-west, extending between Long Range and the sea on the west, and north-easterly to Grand Lake.

3. **Minerals.**—As in the Dominion, the mineral wealth of Newfoundland is neither developed nor fully known; but the crystalline and other rocks, that are so prolific in economic minerals on the mainland, are believed to be equally so in this island. As yet *Copper* has been the only mineral mined, and although the working of this ore is still in its infancy, so great has been the quantity exported, that Newfoundland ranks as the sixth copper-producing country of the world; between 1869 and 1879 over 175,000 tons of ore were exported, valued at about \$4,675,000. The ore exists everywhere in the serpentine rocks; the chief mines are at Tilt Cove and Bett's Cove on the north-western shore of Notre Dame Bay. The copper ore has hitherto been exported to Swansea in Wales, to be smelted; but of late smelting furnaces have been erected at Bett's Cove for the extraction of the metal; and here the mining is of a systematic, thorough character. The amount of this metal in Newfoundland seems practically inexhaustible.

Lead is thought to exist widely; it has been found in the Laurentian and most of the Paleozoic rocks, but has not as yet been mined to any considerable extent. Mines of good quality exist at the head of Placentia Bay, and north of St. George's Bay on the south-west.

Iron is known to exist in the Laurentian regions and elsewhere, but no mines have been opened; *gold* has also been found; *nickel* has been mined to some extent.

Gypsum is, perhaps, distributed more profusely and in greater volume in the Carboniferous country than in any

part of the American continent of the same extent." It is especially developed around St. George's Bay.

Coal.—The Carboniferous region also contains bituminous (or soft) coal in workable seams; no mines have yet been opened, but from the appearances presented in the exposure of one seam it is calculated that underlying an area of thirty-eight square miles near St. George's Bay, there are about 55,000,000 chaldrons. This is but one of the many seams in the same region. *Marble* of almost every shade of colour is found on both the east and west coasts; *granite* and other *building stone*, *grindstone* and *whetstone-grits*, and *limestone* are also met with abundantly.

4. *Outline*.—As might be inferred, the outline of Newfoundland is exceedingly broken; the gradual sinking beneath the sea of the numerous mountain ridges, of necessity gives rise to a very irregular, tortuous coast outline,—the long deep valleys become bays and inlets; the ridges, peninsulas; and the detached hills or higher eminences of ridges become islands. In consequence, the coast everywhere, except at the heads of the inlets, is rocky and forbidding, often presenting high walls worn perpendicular by the undermining power of the waves of the Atlantic.

Of the *Peninsulas*, the two most important are the *Northern* and the *Avallon* peninsulas, the latter joined to the other part of the island by a very long, narrow isthmus.

The *Islands* are numerous, especially on the eastern coast. *Belle Isle*, a dreary, barren mass of rock at the north, gives its name to the strait entering the Gulf.

The *Capes* are mainly in the open sea. The well-known *Cape Race* is a bold headland where the European mail steamers make a call; the coast is very uninviting and has been the scene of many shipwrecks. A strong indraught into the great bays exists, and also an irregular current and undertow caused by two tidal waves that are here confluent; *St. Mary* and *Ray* are the other capes on the south, the latter being fifty miles from Cape Breton Island. On the west are *Anguille*,—a wild coast stretching from Cape Ray to this point,—and *St. George*; on the north, *Norman* and *Bald*; on the east, *St. John*, *Freels*, and *Spear*—the eastern extremity of the island.

5. *Coast Waters*.—The inlets of the sea are numerous and, for the island itself, highly important; they modify the outline very markedly, stretching far into

the land; and more important still, they are the resort of untold multitudes of the most valuable of the food fishes, cod, herring, salmon, and lobsters.



FIG. 63.—DRYING CODFISH.

The chief bays on the south are *St. Mary's*, having fine salmon fisheries, with a fertile soil on the coasts; *Placentia*, the largest of the coast waters, ninety miles long and fifty-five wide at the mouth, with unsurpassed fisheries of cod, salmon, and herring; *Fortune*, one of the principal scenes of the herring fishery. The rest of the southern part of the island has a straight shore, indented with innumerable harbours and narrow inlets. On the west the bays are *St. George's*, around its shores being some of the most fertile valleys in the island, but almost without human inhabitant; *Bay of Islands*, with three branches, having very valuable winter herring fisheries. In the east the bays are *Hare*, almost girdled with lofty hills; *White*; *Notre Dame*, a magnificent sheet of water over fifty miles wide and eighty long, the whole coast of which for many miles inland being covered with mining grants and licences for digging copper; *Bonavista*, with numerous fertile islands; *Trinity*; *Conception*, the most important commercially of all the bays, having around its shores a much larger population than exists around any other bay; *Strait of Belleisle*, between the island and Labrador, its narrowest place being about twelve miles wide. This strait never freezes over.

6. **The Banks of Newfoundland.**—"The remarkable submarine plains at some distance (a hundred miles), from the shores of Newfoundland, where the finest codfish are taken, and where they are most abundant, are not, as was long believed, masses of sand borne thither by the Gulf Stream and the River St. Lawrence. They form a rocky submarine plateau, whose eastern and southern borders descend steeply to a great depth. The Grand Bank extends over fully nine degrees of latitude from north to south; from west to east it covers in some places five degrees. The depth of water varies from fifty to three hundred and sixty feet. Beyond the Grand Bank to the eastward lies the Outer, or False Bank, upon which the sea is from six hundred to nine hundred feet in depth. To the west there are several smaller banks. At the west end of the Great Bank soundings have shown a depth of nine thousand feet; the depth around the bank is from ten thousand to fifteen thousand feet. The water on the bank is not warmer than that surrounding it at a depth of three hundred to six thousand feet, namely, $39^{\circ}.2$ to $42^{\circ}.8$. The fishing grounds do not extend over the whole bank, but have an extent of about two hundred miles in length and sixty-seven miles in breadth. For nearly four hundred years this 'cod meadow' has been fished by large fleets of various nations without showing any decrease in productiveness. The cod taken on the Banks is larger and finer in quality than the fish taken along the shores of the Island or of Labrador."

7. **Rivers.**—Newfoundland has numerous rivers flowing in the valleys between the ridges of hills; but few are of any considerable length; two or three, however, are quite large. The *Exploits* River starts near the south-west corner of the island, twelve miles from the sea, and runs north-easterly to the Bay of Exploits, two hundred miles distant; for fourteen miles in its lower course it is a large river varying from a mile in width at its mouth to half a mile farther inland; it has several waterfalls, the Grand Falls, about thirty-five miles from the mouth, being particularly fine. The river abounds in excellent salmon. The *Humber*, issuing from Deer Lake, is the next largest river and is of a true Laurentian type. At certain points in its course perpendicular rocks, several hundred feet high, spring from the deepest water. It flows into the Bay of Islands.

The *Gander* rises near the southern coast, and after passing through a lake of the same name enters Gander Bay. The *Codroy* in the south-west is a small stream, but flows through a valley containing the finest land in the Island.

8. **Lakes.**—Lakes are so numerous that, were the island mapped out in detail, more than one-third of the whole surface would probably be represented by water. From the top of some of the highest hills from sixty to one hundred and fifty ponds and lakes have been counted. The largest lakes are all exceedingly narrow, and for

the most part are merely expansions of the rivers on whose course they lie.

Grand Lake, fifty-six miles long, is the largest in the Island; its surface is only fifty feet above sea level, but its deepest portion is over three hundred feet below sea level. Its waters pass off into the *Humber*.

Red Indian Lake, on the course of the *Exploits* River, is thirty-seven miles long, and from half a mile to three miles wide. *Great Gander Lake* has a breadth of only two miles, and *Deer Lake*, on the course of the *Humber*, is only ten feet above high tide level.

9. **Climate.**—The climate of Newfoundland is insular, not exposed to so great extremes as a continental climate, and in addition having some peculiar features of its own. The thermometer rarely sinks below zero in winter, or rises beyond eighty in summer. The Arctic current that passes down the eastern coast, produces a chilling effect that is unknown on the west coast; the icebergs that come with this current in spring and early summer still further lower the temperature. As in all northern maritime countries, the moisture-laden atmosphere makes the cold more keenly felt than does a dry atmosphere, even though the cold of the latter is much greater.

At St. John's the mean temperature from 1857 to 1864 was $41^{\circ}.2$ (Fahrenheit); the maximum temperature 83° ; the minimum 7° ; the mean temperature of Toronto is some three degrees higher. But St. John's is exposed to the effects of the Arctic current. At St. George Bay in 1874, the mean was $43^{\circ}.8$, the lowest 15° ; at Toronto $41^{\circ}.3$, the lowest $7^{\circ}.5$. Winter begins and ends much at the same time as in southern Ontario, but the frost does not penetrate so deeply, nor is the snow-fall so great; the air, however, is less clear, and high winds are much more common than in Ontario, though these do not extend far out to sea. The fall is especially fine and is much longer than on the continent, but as in Nova Scotia, the springs are late. The climate of the west coast is much better in every way than that of the east.

The moisture is not excessive; including melted snow, the average annual fall is 58.30 inches. During a portion of the year, summer especially, fog is very common on the Banks and on the coast; but only when the southerly or south-easterly winds blow, does the fog roll in on the land, or penetrate beyond a few miles inland; often too, while the sea is shrouded in fog, the whole island is clear.*

10. **Vegetation.**—All the northern trees—*pine*, *tamarack*, *spruce*, *birch*, and others—are found, often in dense forests, along the rivers and lakes, and at the head of all the bays; oak, beech, maple, chestnut, and walnut are not found. Wild flowers and plants are of much the same kind as in southern Quebec and Ontario; grasses are luxuriant; all the garden vegetables thrive well; fruit,—*apples*, *pears*, and *plums*,—do not grow

* Hatton and Harvey's "Newfoundland," 1883.

* Sea-fog is not injurious to health, rather the reverse; it never contains noxious gases as does the land-generated fog.

well on the exposed eastern part of the island. Of the food grains, *barley* and *oats* do well everywhere, but wheat does not seem to thrive in the east or south; what the west and interior will do has yet to be shown.

11. *Animals*.—*Wild fowl* of all kinds, both of the water and of the land, abound in Newfoundland. The *caribou*, or *reindeer*, are very numerous; their feeding grounds are mainly the "barrens,"—open, stony ground covered with low vegetation, found near Grand Lake especially,—and the moss and lichen-covered savannas of the interior. They migrate to the south during the winter. *Bears* and *wolves* are very scarce; there are said to be no moose; reptiles and noxious animals are unknown.

The famous Newfoundland *dogs* have nearly all disappeared; very few fine specimens are to be met with.

12. *Industries*.—The great industry of Newfoundland is the *Fisheries*, the annual value being \$8,000,000, four-fifths of the whole value being derived from the *Cod-fishery*.

No other country in the world approaches this enormous yield in the cod-fishery; Norway comes second, and Canada third.

The people of Newfoundland generally fish near the shore in open boats, or on the Labrador coast; very few engage in "banking," although it is much more remunerative, the outfit, however, is more expensive. As in New Brunswick, the fishermen are slow to adopt new and improved methods in their work. The Bank fisheries are now prosecuted chiefly by the Americans, French, and Nova Scotians.

The water from the Arctic Ocean, at times ice-laden, flows down past Labrador, surrounds Newfoundland, fills the Gulf, and bathes the eastern shore of America as far as Cape Hatteras. "These icy waters swarm with minute forms of life constituting in many places a vast ocean of living slime; and the all-pervading life which exists there, affords the true solution of the problem which has so often presented itself to those engaged in the great fisheries—where the food comes from that gives sustenance to the countless millions of fish which swarm on the coasts of Newfoundland and Labrador, and in Dominion and United States' waters, or wherever the Arctic current exerts an active influence." In the Arctic seas the waters are characterized by a variety of colours, and it is found that if a fine insect net be towed after a ship it becomes covered with a film of green in green water, and with a film of brown in brown water. "It is a living slime, and where it abounds there are also to be found swarms of minute crustaceans (*i. e.* shell-fish) which feed on the slime, and in their turn become the food of larger animals." These films are *diatoms*. (See Part I. "Organic Life," sec. 8.)

The cod appears on the coast of Newfoundland early in June, preceded by the caplin on which it feeds,—beautiful little fish with which the waters of the coast are alive for two months, and of which myriads are taken to be used as bait or as manure for land; the caplin on its departure is succeeded by the squid,

or cuttlefish, and this by the herring, late in September, on both of which the cod feeds until it retires to deep water early in November, when the fishing season ends.

The *Seal fishery* follows next in importance. The number of seals taken varies considerably from year to year, much depending upon the state of the weather in the sealing season, this being during the months of March and April. The fishing grounds are off the coast of Labrador, off north-eastern Newfoundland, and in the Gulf of St. Lawrence.

The young seals are born on the floating ice about the middle of February, and being fed by the mothers, they are in good condition by the middle of March; about the first of April they take to the water. Before this occurs the seals are easily slaughtered with clubs by the crews of the vessels hunting them; after that time other and more difficult methods of capture have to be resorted to. Seal fishing is a rough, dangerous employment; the vessels are sometimes crushed by the ice, or driven by the fierce spring storms away from the ice-fields, and the hunters that are still on the ice, are left to perish.



FIG 64.—KILLING SEAL.

The *Herring fishery* is very important. Beside the fish exported, vast numbers are used as bait in the cod-fishery. The chief centres of this fishery are Labrador, Bonne Bay, Bay of Islands, St. George's Bay, and Fortune Bay.

The Exploits River is the chief centre of the *Salmon* fishery, though the fish are found in all the rivers.

Lobsters fishery is nearly as valuable as the salmon fishery. (See Append. I., *u.*)

Mining.—*Copper* alone is mined; in 1881, ore to the value of \$596,000 was exported.

* Hatton and Harvey's "Newfoundland."

The *Lumber* capabilities are not developed yet; no lumber at all having been exported, but a great deal imported.

Agriculture, until within late years, was systematically discouraged by the great fish merchants of England, and consequently only slight clearings existed around the villages. At present attention is being seriously turned to the cultivation of the land, and surveys are being made and roads constructed with a view of opening up agricultural lands, for the fisheries cannot support the increasing population.

The *Manufactures* are but few and are wholly domestic, consisting of boots and shoes, furniture, some machinery, tobacco, twine, nets, ropes, and leather,—all at St. John's.

13. The Trade of Newfoundland consists in exports of the products of the fisheries and of the copper mines, and in imports of breadstuffs, meats, clothing, and manufactured goods.

Great Britain and Brazil take each about a third of the exports; Portugal takes a large amount, the United States, Canada, and the West Indies being the next best customers. See Append. I. (*w*).

14. Routes.—A railroad extends from St. John's to Tilt Cove; another is projected to Hawke Bay on the north-west, with a branch to the Bay of Islands, and a third to near Cape Anguille to connect by means of a ferry fifty miles wide, with a railroad in Cape Breton; by this means the sea-voyage to Europe will be greatly shortened.

15. Cities and Towns.—*St. John's*, the capital, (population 30,000) is situated on a harbor of the same name, opening to the Atlantic. The entrance to the harbor is very narrow, and between hills, often perpendicular, six hundred feet high. The harbor—one of the finest harbors in the world—is nearly land-locked; it is a mile long, and a half a mile wide, the water being from fifty to sixty feet deep. A fine graving dock has lately been erected, capable of holding the largest vessels.

St. John's is a "fish city" as Ottawa is a "lumber city," almost the sole export being fish. Of late years many fine buildings have been erected in it. The manufactures of the island are confined to this place.

Harbor Grace (pop. 8,000) on Conception Bay, is a thriving, active town, with a good deal of trade. *Bonavista* on the bay of the same name, is one of the oldest settlements in the island. *Heart's Content*, on Trinity Bay, is the landing place of the Atlantic cables. On the shores of the different bays there are a number of little towns varying in population from 500 to 1,500.

16. Inhabitants.—The total population is about 185,000, consisting of Irish and English and their descendants. The people are all settled on the coast.

The Indians, who inhabited the island in large numbers when first discovered, have all disappeared.

17. Education is provided for by means of Public Schools. High Schools have yet to be established.

The Government is like that of Canada.

18. French Territory.—South of Newfoundland the French own the islands of St. Pierre and Miquelon; these islands are very valuable as fishing stations, and as a centre of extensive trade with Newfoundland and eastern Canada.

By different treaties the French have been granted concurrent rights with British subjects in the fisheries on the west and north-east coasts of Newfoundland from Cape Ray around to Cape St. John, a region known as the *French Shore*. No territorial rights have been granted.

LABRADOR.

1. Extent and Character.—Labrador comprises the body of land surrounded by the the Strait of Belleisle, the Atlantic, Hudson Strait and Bay as far as Rupert River; on the south the boundaries are Rupert, Mistassini, and Betsiamites Rivers. Newfoundland has jurisdiction over the eastern part, enclosed approximately by the meridian of 65°, the parallel of 52° as far east as a line drawn directly north from Blanc Sablon (in Strait of Belleisle). The territory to the south belongs chiefly to Quebec; all the rest is the North-East Territory of the Dominion. It contains about 425,000 square miles.

Little is known of the country beyond the coast. It is in the main a rugged Laurentian region, with bold, rocky, treeless shores, east and north, and for the most part in the west, except the southern portion. The interior is a plateau from 1,500 to 2,500 feet high, some mountain peaks reaching a height of 4,000 feet.

Minerals are known to exist, but no mining has taken place. One beautiful mineral is widely found—the *labradorite*, a kind of felspar with exquisite play of colors.

The east coast has innumerable little indentations, and one deep one, *Hamilton Inlet*, 150 miles long; *Ungava Bay* lies on the north, an expansion of Hudson Strait.

There are some *rivers*, but their character is but little known—the *Rupert* and *East Main* being the chief ones known; they are all of the characteristic Laurentian type. *Lake Mistassini*, drained by the Rupert River, is said to be the largest of the *lakes*.

2. Climate.—The climate is exceedingly severe, snow lasting till June. In summer the thermometer sometimes marks 75°, but spirits freeze in the intense cold of winter. Only a few hardy vegetables can be grown in the eastern part; early frosts are severe; in the south-west the climate is more moderate, and some grain, it is said, can be raised.

There is a good deal of forest land in the south-west and all along Hamilton Inlet.

Animal life seems to be abundant—white and other bears, reindeer, foxes, wolves, martens, otters, beavers, sables, minks, and waterfowl and other birds.



FIG. 65.—FUR-BEARING ANIMALS.

3. **Value.**—Commercially the country is very valuable; the wild animals of the land furnish furs, and the sea supplies inexhaustible quantities of fish. The coast waters form one of the great fishing regions of the world, but they are subject to violent storms, which are often attended with great loss of life among the fishermen.

Newfoundland fishermen, and very often their families, go to Labrador about the end of June, and remain there, living in huts, till early in October. But Americans and Nova Scotians also frequent the coast in large numbers. The fish taken are the same as those taken in the waters of Newfoundland. The annual value of the catch is over \$5,000,000.

4. **Inhabitants.**—The inhabitants of the south shore, as far as Blanc Sablon, are of French origin, nearly 5,000 in number; those to the east and north are of British origin, mainly English, and number some 2,500 souls. They are engaged in the fisheries during the summer, and in hunting during the winter; in the settlements the greater number are in the employ of the Hudson Bay Company. During the summer a mail

steamer from Newfoundland visits the coast every fortnight.

The Indians, (Montagnais, Crees, etc.,) about 4,000 in number, live in the interior; they have almost all been in a measure christianized by Jesuit missionaries.

The Eskimos, who number about 1,700, live to the north of Cape Webeck; they are expert in fishing, catching seals, and in handling their canoes, or kayaks, in the rough seas. These people are of low stature, with coarse features, small hands and feet, and black, wiry hair. As a rule they live in underground houses till some time in January; then they abandon these for their dome-shaped houses of frozen snow. They are almost all under the christian training of the Moravian missionaries, who have stations at *Hopedale*, *Nain*, *Okkak*, and *Hebron*.

THE UNITED STATES.

1. **Extent.**—In shape the United States approaches a parallelogram, the general compactness and regularity being broken only by the Great Lakes. The extreme length from the eastern point of Maine on the Atlantic coast to the longitude of Cape Flattery on the Pacific, is nearly 2,800 miles. The extreme breadth from the southern point of Texas to the parallel of forty-nine, is about 1,600 miles. The area, including Alaska, is given as 3,602,990 square miles, or about that of Canada; the inhabitable area, however, is much greater than in Canada. The northern boundary coincides with the southern boundary of Canada; the east, west, and south-east are washed by the sea. To the south-west is Mexico; the river Rio Grande lies for a considerable distance between the two countries, the remaining part of the southern boundary being an imaginary line running irregularly west from near the Organ Mountains.

2. **Physical Character.**—Physically, the territory of the United States forms one of the most self-contained countries in the world. The eastern continental axis is almost wholly within it, and the grandest and most characteristic development of the western axis is altogether so. The rivers, with hardly an exception, begin and end within its bounds; the southern tributaries to the Canadian lakes are mere brooks—the watershed is everywhere near the boundary. The useful minerals are all found in profusion. The climate passes from the perpetual summer of Florida to the arctic winters of Maine. The productions include all the necessities and almost all the luxuries of life, from the oranges, cotton and sugar of the tropical South, to the wheat, wool and fish of the cold North; what one part lacks the other supplies. The oceans and the great rivers are natural highways for national intercourse. The varied climate with the varied productions give rise to diverse industries,

and the productions and industries of one section have their complements in the productions and industries of another. Perhaps China and India are the only other countries that naturally need so little material assistance from the outside world.

3. **Physical Features.** The general physical characteristics, climate, &c., have been referred to under "North America"; more particular reference to these will be made under each subdivision.

4. **Minerals.**—The mineral wealth of the United States is exceedingly great. The *Coal Measures* are estimated to cover an area of 185,000 square miles, but the workable portion of this "probably does not exceed 120,000."

The carboniferous coal measures include several detached areas: The *north-eastern* area, extending from Newport in Rhode Island northward into Massachusetts; the *Alleghany* area, extending from New York and Ohio to Alabama, having the greatest development in Pennsylvania; the *interior* area, including the central part of Michigan, a great deal of Illinois, and part of Indiana and western Kentucky, and a part of Minnesota, Iowa, Missouri, Kansas, Arkansas, and Northern Texas. Other coal areas are found in the upper Mesozoic (Cretaceous) and the Tertiary strata of the Rocky Mountains, especially in Colorado, Oregon, and Washington.

Pennsylvania produces all the anthracite, and nearly half of the bituminous coal; Illinois and Ohio each about a third as much of the latter as Pennsylvania; Maryland, West Virginia, Indiana, and Iowa being the other chief coal-producing states.

Iron is very widely distributed, twenty-three of the states mining it. But the great iron producing states are Michigan, Pennsylvania, New York, New Jersey, and Missouri.

Copper is just as widely distributed as iron, but not in such extensive deposits; one state, Michigan, furnishes nearly five-sixths of the whole amount mined in the country; Arizona, Vermont, North Carolina, Montana, and California follow next in order of productiveness.

Zinc is mined mainly in New Jersey, Missouri, Pennsylvania, and Virginia.

Lead is abundant in the region including eastern Iowa and Missouri, and north-western Illinois. California yields nearly half of the *Mercury* used in the world.

Twenty-two states yield *gold*, and eighteen *silver*; of the gold, California in 1880 yielded over half the amount

mined, Nevada, Dakota, and Colorado being the next most prolific states. Of silver, Colorado, in the same year, produced over two-fifths of the quantity mined, Nevada nearly a quarter, Utah, Montana, Arizona, and California the greater part of the rest. Colorado, California and Nevada are the great mining states for the precious metals.

5. **Farm Products.**—Great and important as are the mineral productions of the United States, the farm products are vastly more so. Every state is more or less engaged in agriculture of a kind suited to the circumstances of climate and soil.

The states of the north-central region—Illinois, Indiana, Ohio, Wisconsin, Minnesota, Iowa, Missouri,—together with New York and Pennsylvania of the Atlantic region, are the great food producing states. Of these Illinois takes the lead in the production of Indian corn, rye, oats, wheat, and live stock. Barley is raised to the greatest extent in New York, Wisconsin, Iowa, Minnesota, and California, the last raising twice as much as any other state, and ranking sixth in the production of wheat.

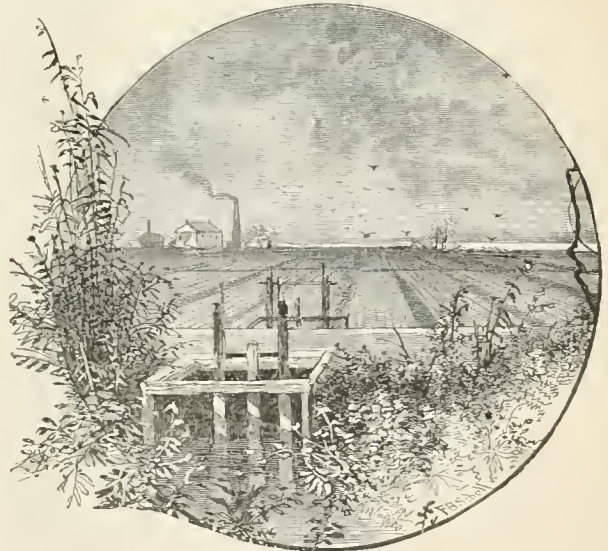


FIG. 66.—RICE FIELDS.

The *Rice* region fringes the southern waters, beginning with North Carolina. Of the states in this region South Carolina produces nearly half of the rice, the most of the remainder coming from Georgia and Mississippi.

The *Cotton* region includes the rice region, but extends farther north, into southern Virginia, Kentucky and



EASTERN



Key West, FLORIDA

Missouri: these states, however, produce comparatively small quantities. Mississippi produces the most, but is nearly equalled by Georgia and Texas.

The *Sugar region* corresponds with the rice region excepting that it does not include North Carolina; Louisiana, however, yields almost all the sugar and nearly three-quarters of the molasses.

Potatoes are abundant everywhere north of Maryland,—New York and Pennsylvania raising the most; *sweet potatoes* are raised but to a small extent in the northern districts, New Jersey being the only State that grows in abundance both the common and the sweet varieties.

The quantity of *Tobacco* raised is inconceivably great; in 1880 it amounted to nearly 473,000,000 pounds, every state, except four of the Rocky Mountain states, producing it. Of this vast quantity Kentucky raised over a third. The tobacco region lies between the parallels of 35° and 40°.

Stock Raising is an exceedingly important industry everywhere; in general the greatest amount of the various kinds of stock is found in the leading agricultural districts; while Texas and the prairie states rear the greatest number of beeves.

In the production of *Wool* Ohio stands first; over 25,000,000 pounds were raised by that state in 1880; California stands next, followed by the leading northern agricultural states.

The great *Dairy States* are in the north, New York far surpassing all others; in proportion to their size the New England States produce both butter and cheese in very large quantities; the North-central States, in this as in other branches of farming, take a leading position, California and Pennsylvania nearly equalling them.

6. **The Forest industry** is of great magnitude; physical conditions of climate and soil largely confine it to the north-eastern Central States. Nearly a quarter of the sawn products of the forest in 1880 came from Michigan, a quantity far exceeding that from any other state; Pennsylvania, the next in order of production, manufactures only two-fifths as much. The other states next in importance in this industry are Wisconsin, New York, Indiana, Ohio, Maine, and Minnesota.

7. **The Fisheries** in the United States waters, excluding the oyster fishery, though very valuable, are much inferior to those in Canadian waters. South of New Jersey, fishery is carried on in open boats only, and is comparatively unimportant; but north of that state,

especially in Massachusetts and Maine, by far the most valuable part is carried on by well-equipped vessels which go for their cargoes to the Banks of Newfoundland, Labrador, the Gulf of St. Lawrence, and elsewhere in the open sea. In the east the coast of Massachusetts and the south-east coast of Maine are the finest fishing grounds. On the Pacific coast, including Alaska, the fishery is very valuable, but except in the case of salmon is developed but little. The oyster fishery is practically confined to the coast from Connecticut to North Carolina, the most prolific region by far being the Chesapeake Bay.

8. **Manufactures.**—The manufactures of the United States are very extensive, and exceedingly varied in character, but with the exception of agricultural implements and articles of food the greater part are produced in the Atlantic States from Maine to Maryland. Agricultural implements, breadstuffs, and prepared meats, are manufactured chiefly in the leading agricultural states of the north-central region, and in some of the Atlantic States; manufactures in iron come from those states that furnish the ore.

9. **Shipping.**—In tonnage of vessels the United States ranks second in the world, the amount owned being about two-thirds that of Great Britain. This industry for some years past has been declining; the foreign trade is mainly carried on in foreign vessels, none, however, but vessels built and owned at home are permitted to trade between port and port of the United States. In 1881 the amount of shipping owned was somewhat over four millions of tons.

10. **Trade.**—The Trade of the country, import and export, though very great, amounting in 1882 to nearly \$1,458,000,000, did not, in that year, equal half that of Great Britain; it was nearly equal to that of France. Foremost, as regards value, in the list of articles exported stand wheat and flour, and then follow cotton, tobacco, pickled pork and hams, butter and cheese. Coal oil is also largely exported, and in recent years manufactures of cotton have been sent abroad in large quantities. Considerably more than one half of all the exports go to Great Britain and Ireland, the rest being taken chiefly by Canada, France, and Germany.

11. **Inhabitants.**—The census of 1880 gives the total number of inhabitants in the United States as 50,442,066. The increase has been very rapid; in 1870 the population was under 39,000,000.

According to the last census nearly 7,000,000 of the inhabitants were born in foreign countries. The number of immigrants arriving in 1882 was over 700,000. Immigrants come from almost every country in the world; of late years Germany has given a third of the total number; Great Britain and Ireland over a fifth; Norway, Sweden Italy, and Canada supplying nearly all the remainder.

All creeds and nationalities are equal in the eyes of the law, full rights of citizenship being conferred as soon as the foreigner becomes naturalized. In 1882, however, the immigration of Chinese labourers was prohibited, and Chinese were declared incapable of becoming citizens. The Chinese, nearly 250,000 in number, are mainly in California, and the plateau states and territories.

Very little of the foreign-born population is found south of Pennsylvania; the manufacturing and trading towns and districts take nearly all. In almost all the manufacturing towns of the east and centre the proportion of foreign-born inhabitants is from a fifth to a third; in some few cases in New England it is nearly a half. Large numbers of Germans and of the immigrants from Great Britain take up farms in the West, the former showing a decided tendency to settle in communities by themselves.

12. *Education* is provided for by the laws of each State, the central government not interfering in educational matters. There is, however, a great deal of illiteracy among the negroes and the lower-class whites of the South.

13. *Government*.—The government is a Federal Union similar to that of Canada. Each of the original states was sovereign and independent, but on the framing of the Constitution for the proposed union, each surrendered certain specified powers to the general government, retaining all others. The United States has, therefore, a written Constitution. The confederating Provinces of Canada, on the other hand, surrendered *all* their powers to the general government, receiving back certain specified ones; all others are lodged with the general government.

As in Canada, the general government of the United States takes cognizance of all matters that concern the nation as a whole: all dealings with foreign countries, (this power not being possessed by Canada), matters relating to postage, coinage, general defence, national, or public, lands, &c., while the states deal with all matters pertaining to themselves alone.

Every male citizen of the United States, native or naturalized, with very trifling exceptions, over twenty-one years of age, has the right to vote.

The government consists of three branches—the legislative, executive, and judicial. The executive power is vested in a president, who, together with a vice-president, is elected for a term of four years by electors chosen for the purpose by popular vote of the states; each state chooses as many electors as it has representatives in Congress. The President chooses his own cabinet ministers, seven in all, subject to the approval of the Senate. These ministers have no seat in Congress, and are not directly responsible to Congress, but to the President. The President is commander-in-chief of the army and navy; he appoints federal officers and makes treaties with other countries, subject in both cases to the approval of the Senate. All bills passed by Congress are submitted to him before they can become law; if he vetoes a measure it may become law notwithstanding, by a two-thirds majority in each branch of Congress again voting in its favour.

The legislative body, called Congress, consists of two branches, the Senate and the House of Representatives. The legislature of each state elects two senators by a majority vote,

for a period of six years. The Senate may originate any measure except financial measures. The House of Representatives consists of members chosen by popular vote in each state. There are at present 325 representatives apportioned among the states according to population. With each census the number and apportionment of these are changed.

The judicial branch of the federal government consists of a supreme court and various inferior courts. All the judges of these courts are appointed by the President, subject to the approval of the Senate. The supreme court consists of a chief justice and several associate judges. The decision of this court in all matters brought before it is final; it is the highest court in the nation, and has power to set aside Acts of Congress if found unconstitutional. In Great Britain and Canada, Parliament is the highest court.

The government in the separate states is mainly the same in form as the federal government. Each state has a governor and two branches of the legislature, and the duties of governor and legislature are analogous to those of the general government.

The Federal Capital is WASHINGTON, situated at the head of the Potomac estuary in the District of Columbia.

14. *Natural Subdivisions*.—Physically the United States falls into three leading natural subdivisions,—the *Eastern or Atlantic Seaboard*, including the Alleghany region; the *Central Area*, extending from the Alleghanies on the east to the Rocky Mountains on the west; and the *Western Plateau Region*.

The height of the Rocky Mountains and their comparatively abrupt rise from the eastern side of the plateau causes a more marked difference in the climate and organic life of the adjacent areas of the Central and Plateau regions, than is usually found on the borderland of physical subdivisions. The Alleghanies are neither abrupt nor high, and in consequence differences in climate and organic life in the adjacent areas of the Central and Eastern subdivisions, are not strongly marked, though this mountain region intensifies the contrast everywhere seen between a maritime and an inland country. The south-west return-trade winds, moreover, which blow parallel to the trend of the Alleghanies, have a tendency to counteract in adjacent areas the differences produced by these mountains; while the same winds, by blowing across the trend of the western plateau ranges, and thus losing moisture, increase the differences between the western border-regions caused by the abrupt rise and greater elevation of the land. In the southern portion of the Eastern and Central divisions where the mountain barrier has disappeared, there is little or no difference in physical characteristics, both portions being maritime and semi-tropical. (See "North America," sec. 13).

THE EASTERN OR ATLANTIC SEABOARD DIVISION.

15. Surface Features.—The width of this division varies; it reaches its maximum in the southern portion, where it exceeds two hundred miles, and its minimum—about sixty miles—somewhat north of the centre. From Florida to Cape Hatteras the breadth is uniform; at Cape Hatteras the land, instead of continuing in a north-easterly direction, turns to the north, till in the state of New Jersey, the water approaches the neighbourhood of the mountains. At New York there is a decided eastward trend of the land, and the breadth of plain is thenceforth greater, reaching in some places about one hundred and fifty miles.

Nowhere throughout the whole extent of the coast is the shore high; in the northern part it is rocky and forbidding almost everywhere, but yet low; in the southern part in most places it is not even rocky, but passes under the sea with a very gentle slope. Everywhere there extends with a breadth varying from ten to fifty miles, a low, level, sandy plain, with swamps which become large and numerous towards the south. This plain is wholly of Tertiary formation. West of this sea-board plain is a higher level, very narrow in the middle, but in the south over 60 miles broad. In the north-east this belt is hilly and broken, the soil for the most part being poor; in the middle it is undulating, containing some of the richest and most attractive districts on the continent; the southern portion has a poor, sandy soil, usually covered with pitch-pine trees, and known as the "pine barrens."

Back of this belt lies the upland region, rising into the mountains.

16. The Appalachian Mountains.—These mountains form the western boundary of the Atlantic plain. In structure they are the same as in Canada; central masses of crystalline rock are met with in various places, but palaeozoic rocks, here and there pierced by granite, form the greater part of their bulk. Silurian strata predominate, but from the centre, southward, carboniferous strata cover a wide area. On entering from Canada these mountains, here called the Green Mountains, run directly south into Connecticut in two or more parallel ridges, one of these, the White Mountains, containing Mount Washington, nearly six thousand three hundred feet high. The *Adirondacks* to the west do not properly

belong to the Appalachian system of mountains (see "Canada," sec. 2). In the neighbourhood of the Hudson the Appalachians are known by several local names, among others the *Catskills*. From this point the mountains turn again to the south-west, having three distinct ridges. "The most westerly embraces the *Alleghany* Mountains in Pennsylvania, and the *Cumberland* in Tennessee; the middle is a broad belt of long and narrow ridges, separated by valleys of a similar character, and broken by transversed *defiles*; while the eastern, which is the most beautiful and picturesque of the three, extends to Georgia under the name of the *Blue Ridge*; the valley between the last two ridges is highly fertile. The highest elevations are found in this region, Mount Buckley having a height of 6,600 feet." The summits here are often treeless and dome-shaped, a circumstance that gives rise to names some of them bear,—such as Mitchell's Dome, Piomigiog Bald.

17. Minerals.—The minerals of this region, found almost exclusively in the mountains, are characteristic of the strata found in Canada. In the northern part the metaliferous deposits do not seem to be very rich, yet in places in all the states they are rich enough to be profitably worked,—especially the deposits of iron. Copper, lead, and antimony are also found. Marble, granite, and limestone, for building or other purposes, are met with everywhere, several fine varieties of the first occurring in Vermont.

But the mineral wealth of the country is nowhere in such magnificent deposits as in the central region of the mountain chain—from northern New Jersey to Virginia. The annual value of the coal alone is nearly equal to that of all the gold and silver produced in the whole of the United States. In the central region of the Appalachians iron-bearing strata are as extensively developed as the coal-bearing strata, and even more extensively than the latter in North Carolina and other of the southern districts. The close proximity of iron and coal throughout all this region is of the highest industrial importance. Silver and gold are found in small quantities throughout the ranges,—gold mining yielding profitable returns in North Carolina. Zinc is mined in Pennsylvania, and extensively so in North Carolina; it is known to exist in all the southern mountain area. Copper occurs in many places, but excepting in North Carolina, is mined only to a small extent. Petroleum is found mainly in Pennsylvania; enormous quantities are pumped from the wells every year (in 1882 nearly 1,162,000,000 gallons). Numerous salt springs from which large quantities of salt are made, occur often in close proximity to the oil wells.

18. Coast Features.—Were it not for Cape Hatteras and Cape Cod the outline of the Atlantic coast would be almost unbroken, for the peninsula of Delaware and eastern Virginia, and that of southern New Jersey, conform to the trend of the coast, their southern extension almost closing the mouth of the bays west of them. Florida is a continental feature.

The *Capes* are numerous, but only a few are important: *Cape Fear* and *Hatteras* in North Carolina; *Cape Charles*

in Virginia at the entrance to Chesapeake Bay; *Cape May* and *Sandy Hook* in New Jersey, at the entrance to Delaware Bay and New York Harbor respectively; *Cape Cod* at the northern end of the peninsula of the same name, and *Cape Ann*—both in Massachusetts.

The last two, with Hatteras and Sandy Hook, are the only capes heard of except in navigation of a very limited local nature. Cape May is one of the most frequented of the watering places in the United States.

All these capes are low-lying, and all are sandy except Cape Ann.

Islands fringe the coast almost throughout its entire length, but they are all close in shore excepting *Long Island*, the islands of Massachusetts—*Nantucket* and *Morha's Vineyard*,—and a few on the coast of Maine, particularly *Mount Desert*. As already stated, the most of these coast islands are alluvial, composed of sediment deposited by ocean currents, or of sand washed up by the ocean waves and then often raised high above the water by the action of winds. Even where the nucleus is not alluvial, as in the case of the first three mentioned, the greater part of the island is still composed of sand; the bars and thread-like projections that line *Long Island*, are identical in form and character with those lining the Carolina coast. On the New Jersey coast a few rocky islands are found; but on the coast of Maine they form almost an archipelago.

19. Coast Waters.—As might be expected from the character of the shore, the waters in the neighbourhood of the coast are shallow; this is more markedly the case off the southern and south-eastern New England coast; the shallow water, less than a hundred fathoms in depth, extends south to at least the parallel of forty, and east of Cape Cod for fully a hundred and fifty miles. This high elevation of the submarine part of the continent produces numerous shoals, including that at the entrance to New York Harbor and the Nantucket shoals, where, in a heavy sea, even schooners will strike bottom. These shallow waters are the scene of extensive fisheries. Some of the "banks" are as far from land as is the Grand Bank of Newfoundland.

None of the bays or other inlets are open except those of the New England States,—*Cape Cod Bay*, *Casco Bay*, and others on the coast of Maine, *Albemarle*, *Pamlico*, and other "sounds" on the Carolina coast are shut off from the ocean by the alluvial islands, in some cases to such an extent that the water, everywhere shallow, is only brackish. *Chesapeake Bay* is almost land-locked; in length, irregularity, and numerous off-shoots, it closely resembles the mountain inlets of British Columbia; its oyster fisheries are the most extensive in the world. *Delaware Bay* is more open to the sea than is the Chesapeake; its shores are sandy to a much greater extent than those of the latter, and in consequence are less adapted to the propagation of oysters. The spring fisheries, however, are valuable. *Long Island Sound*, 120 miles long, is so completely sheltered that navigation would be perfectly safe in it in all weathers, were it not for the extensive shallows and bars that everywhere border it, especially on the southern side. It is the highway of a very great traffic between New York, the New England States, and the Maritime Provinces of Canada. Large sailing vessels or deep draught steamers do not navigate it; the

"Sound Steamers," for passengers, are widely known for their great size, their speed, and palace-like character.

20. The Rivers are numerous but are of necessity short, and, except in their lower courses in the "tide water" region, are seldom navigable. These lower courses take the form of *estuaries*—broad, often deep, expansions of a river exposed to the action of the tides. On nearly all the rivers throughout the Atlantic sea-board where the second level of the land passes down to the first level, low falls occur; above these on the larger streams such as the Savannah, are long stretches of water navigable for smaller river boats. Large vessels can ascend to the head of all the estuaries, and on the chief rivers river-boats can often go as far as the falls, especially at high tide; for in these rivers, as in the St. Lawrence, the salt water at flood tide backs up the fresh water for a long distance. Thus on the Savannah, ocean ships ascend to the city of Savannah, while steamers of over a hundred tons burden go as far up as Augusta, a direct course of more than a hundred miles. To the north, the Hudson is the only river free for a long distance from obstructing falls in places where the water is otherwise deep enough for navigation.

From Georgia to New York the course of the rivers to the ocean is south-easterly,—at right angles to the mountain watershed; north of New York the river courses are southerly. This last peculiarity is evidently due to the influence exerted by the Laurentian Adirondack Mountains upon the course taken by the Appalachians. On approaching the Adirondacks the Appalachians turn southward and the rivers follow the direction of the ranges. The devious course of the rivers in Maine are due to the same causes as that of the St. John in New Brunswick.

From Georgia to southern Virginia the rivers have their head waters on the eastern range of the Appalachians; but those further north, as far as the Delaware, start on the central or Alleghany ridge, and break through the Blue and other eastern ridges, often in deep wild gorges. The gorge on the Potomac, near Harper's Ferry, and especially the one on the Delaware where the precipices rise to the height of twelve hundred feet, are the most striking examples of this characteristic feature.

Of the chief rivers the *Savannah* lies between Georgia and South Carolina, the *Roanoke* is in North Carolina, the *James* with an estuary fifty miles long, in Virginia; the *Potomac* between the Virginias and Maryland, is about four hundred miles long including its estuary; this estuary, reaching nearly to Washing-

ton, is one hundred miles long, and in places seven miles broad. Near Washington the river has a descent of eighty feet in two miles, including a fall thirty-five feet high. The *Susquehanna*, mainly in Pennsylvania and entering into Chesapeake Bay, is almost wholly among the mountains, and hence is devious in its course and contains numerous waterfalls and rapids. The *Delaware*, expanding into the bay of the same name, which is really only the estuary of the river, forms the boundary between Pennsylvania and New Jersey; the tide in the river reaches Trenton in New Jersey, 130 miles from the sea, but ocean-going vessels cannot pass beyond Philadelphia. The *Hudson*, which has its head waters among the Laurentian Adirondack Mountains, is commercially one of the most important rivers in America. For it has not only the commerce of the numerous cities and of an extensive agricultural country in its own neighborhood, but also in a large measure the commerce of the Great Lakes. The Erie canal, between Buffalo and Albany, and the Hudson River, form one of the chief waterways leading from the west to the ocean. The length of the river is about 350 miles, the tide reaching Troy, 160 miles from the river's mouth. Where the river winds through the Highlands, (Catskill Mountains) the scenery is very fine; this is more especially the case just below the Highlands where basaltic cliffs, called the Palisades, 500 feet high, line the west shore for fifteen miles. The *Connecticut*, starting in Vermont, passes between that state and New Hampshire, crossing two other states on its way to the Long Island Sound. Its chief fall occurs at Hartford. The *Kennebec* and *Penobscot*, both in Maine, are very important in the lumber trade, that of the Penobscot being the largest in the United States. The falls on the latter are at Bangor, sixty miles from the sea, and on the former at Augusta. On the Kennebec such names as Icton point out one of the chief industries.

21. **The Lakes** are few except in the extreme north-east. In Maine, where they are innumerable, they are wholly of the glacial character; the mountain lakes, excepting a few, are within the borders of Canada. Of these *Lake Champlain* is the most important; it has a true mountain character—long, narrow, deep in places, clear, and abounding in fine scenery. It has become a commercial highway between Canada and New York, Champlain canal connecting it with the Hudson at Albany. It is about 120 miles long. *Lake George*, a beautifully transparent sheet of water, lies to the south-west of Lake Champlain. In western New York are several lakes excavated in the older paleozoic strata, and having in most places rocky, often perpendicular, shores. The chief of these are *Cayuga*, *Seneca*, and *Oneida*.

22. **Climate**.—The climate of the Eastern United States is maritime in character, varying according to distance from the tropical regions, and less liable to sudden and marked changes than the climate of the Central area, or of the eastern half of the Plateau region. It is not so decidedly maritime, however, as is the climate of western Europe, for the prevailing winds are not so directly oceanic; the south-westerly winds do not reach the land from the ocean; they therefore do not have the com-

paratively equable character of purely oceanic winds; the prevailing winter winds are north-westerly, and hence are land winds. Some shelter from these is afforded by the mountains, but not enough to prevent the temperature in the north-eastern part from sinking very low. All this north-eastern district, as well as the maritime parts of Canada, is exposed to the chilling north-eastern oceanic winds. These winds bring abundant moisture both as snow and rain, but while retarding spring and making it a tedious season, they do not produce such intense cold as do the drier north-west winds in the same latitudes on the western side of the Appalachian range. The spring in south western Maine is later than in the Eastern Townships of Quebec, though Maine is farther to the south.

In the mountain regions the climate is cooler and the valleys are subject to rapid and great variations in temperature; this is especially the case in the northern portions where, as in the Connecticut valley, changes amounting to sixty degrees in sixteen hours have taken place. Snow, which is very abundant in the north-eastern portion of the Alleghanies, falls to some extent throughout the whole range. (See Pt. I. sec. 27, &c., and Pt. II. "North America," sec. 13).

23. **The Productions and Industries** have been referred to under "United States," sections 5-9.

Nearly one-half of the population and wealth of the nation is in this division of the country, and more than three-fourths of the foreign trade passes through its ports.

24. **Political Subdivisions**.—The Eastern Division of the United States contains seventeen states; these are usually subdivided into three groups, more or less resembling each other in physical characteristics.

25. **New England States**.—These States comprise Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. They resemble each other closely in soil and productions, and to a more limited extent in climate. The soil is only moderately fertile, the alluvial deposits in some of the river-valleys, however, are rich, and yield excellent crops.

26. **Characteristics**.—Agriculture, though in most places scientifically pursued, is not a commercial industry, and breadstuffs have to be obtained from other States. Almost all the *Fishing* on the Atlantic coast, except the oyster fishery, is carried on by New England, particularly by Massachusetts and Maine; the *Mining* industry is

unimportant except in one or two particulars. The water power supplied by the numerous rapid little streams along the boundary between the first and second areas of elevation, is utilized to a very great extent in driving the machinery of *Factories* of almost every kind. New England, too, has long been foremost in *Educational Institutions*, from its two great universities, Harvard and Yale, to its high and common schools. In consequence it has been foremost in intelligence and in intellectual, political, and industrial activity; the multitudes of its people that have emigrated to all parts of the Union, more especially to the eastern north-central states, have carried with them and established in their new homes the love of learning as well as industrial activity. So much has this been the case that New England cannot be said to hold the same relative position in intelligence and learning now as it did in years gone by.

Manufacturing is the one great industry everywhere in these states—cotton mills and woollen mills are found in almost every town; the *manufacture of leather*, and of articles of leather, is almost universal; in 1880 boots and shoes were made to the value of \$96,000,000—over half of the value of those made in the whole Union. *Machinery* of all kinds is made in every large town; articles of metal—iron, steel, copper, brass, gold, silver, &c.,—are made in the three southern states especially, while wooden ware in multitudinous variety, comes from the northern three.

The universal manufacturing spirit causes towns to spring up at every waterfall or rapid on the rivers; the inhabitants of these towns are largely drawn from the country districts, so that in the three northern states, while the population of the towns is steadily increasing, that of the country districts is steadily decreasing. This circumstance, together with emigration to richer agricultural states, has led to the abandonment of great numbers of farms in the poorer localities; the depopulation of rural districts has been so great that the government of Vermont has taken steps to have the abandoned farms again brought under cultivation.

The three northern states, also, on account of their general rugged character, are better suited for grazing than for agriculture proper; hence these states, especially Vermont, have long been well known for the excellence of their dairy products, New England butter commanding the highest price in the markets.

27. Maine.*—Maine is the largest of the New England States, and the least attractive. Back from the coast region it is rough, and unproductive. Forests still cover the greater part of the northern half of the state.

The industries, in addition to the manufacturing, are in connection with the *Forest* and *Fisheries*.

The fisheries are next in importance to those of Massachusetts. *Ice* has, of late years, become an important article of export, especially on the Kennebec River.

Ship Building was once an important industry, but has greatly decayed.

Cities.—*Portland* (pop. 33,810) is the largest city in the state, and one of the chief commercial cities of New England. It has important manufactures of engines, locomotives, and heavy iron articles generally. It is the terminus of the Grand Trunk Railway of Canada, and is the winter port of Montreal ocean steamers. The harbor is good, well sheltered, long, but not very capacious.

Augusta, the capital, 44 miles up the Kennebec, is a little city, but very active in the ordinary industries of the state.

Bangor, on the Penobscot, is the centre of the lumber trade.

28. New Hampshire.—The surface of this state is rough and broken; there is little fertile soil except in the river-valleys. The mountain scenery is especially fine, Mt. Washington and the White Mountains being summer resorts. On Mt. Washington there is a meteorological observatory, established by the Federal Government.

The *Industries* are those of northern New England—including quarrying on an extensive scale.

The chief *Cities*, all small, are *Concord*, the capital; *Manchester*, *Nashua*, and *Portsmouth*—a naval station, the only harbour on the little strip of coast that the state possesses.

29. Vermont is wholly a mountain state; the Green Mountains often reach a height of more than 4,000 feet.

Agriculture is more of a leading pursuit than in New Hampshire or Maine, and stock-raising and dairy farming are carried on extensively.

The *Cities* are all very small, *Montpelier*, the capital, is a mere village; *Burlington*, finely situated on Lake Champlain, is by far the largest town; it is one of the chief lumber markets in the United States, and possesses many important manufactures also. *St. Albans* is one of the chief markets for the dairy produce, not only of the state, but of the Province of Quebec.

30. Massachusetts.—In cultivation, political influence, commerce, extent of manufactures, and general industrial activity, Massachusetts has long held the foremost place in the United States.

It has the most broken and irregular coast of all the Atlantic states; its headlands enclose Cape Cod Bay, Massachusetts Bay, and Buzzard's Bay. The western part of the State is crossed by the Alleghanies, and is rough and broken; but this range is here at its lowest; elsewhere it exceeds 3,500 feet in height. The soil is

* For area and population of the states, see Appendix II.

not naturally fertile, but has been made highly productive by intelligent cultivation; the valley of the Connecticut, however, has a very rich soil. The south-east is low, sandy, and often very marshy.

In the *Fisheries*, Massachusetts is the foremost state of the Union; its fine fishing-fleet, especially from Gloucester, is unequalled in the world.

Manufacturing is the great industry of the state; the articles made are of every conceivable kind, from shoelaces and pins to ships. The chief manufactures consist of cotton and woollen goods of all kinds; leather and articles of leather; iron implements and combinations of wood and iron; machinery and castings and innumerable articles of wood. Massachusetts is surpassed in value of manufactures only by New York and Pennsylvania. In 1880 the value of the manufactures was over \$631,000,000.

In general shipping Massachusetts excels every other state, and in foreign commerce stands next to New York.

Some little *Mining* of iron and of an exceedingly hard kind of anthracite coal, is carried on.

Cities.—On account of its manufactures, Massachusetts is one of the most densely peopled states of the Union; it contains very many cities, some of them of large size.

Boston (population 362,500), the capital, and largest city, is situated on rising ground at the western extremity of Massachusetts Bay. The harbor, though capacious and safe, is not deep; the entrance is protected by numerous islands, sandy for the most part, and sometimes high.

The industries of the city are the same as in the state at large, but include others peculiar to maritime towns. Numerous railroads from all directions terminate here.

The first city of New England, Boston is one of the first in the United States in population, manufactures, and commerce; it surpasses all others in the number, variety, and excellence of its educational institutions—colleges, public and high schools, schools of science, libraries, museums, &c.

Boston is one of the few old cities of America, and like all these cities, its streets have not that monotonous regularity that characterizes the ordinary American town. It has numerous suburbs, cities themselves, such as *Cambridge*, containing the celebrated Harvard University, and *Chelsea*.

Lowell, *Fall-River*, and *Laurence* hold the first place in the manufacture of cotton and woollen goods; *Haverhill* and *Lynn*,

have the leading boot and shoe factories; *Worcester* manufactures agricultural and other machinery, and *Springfield*, fire arms and railroad cars; *Holyoke* has large paper mills; *Gloucester*, and its neighboring town of *Marblehead*, are the chief fishing towns of the United States; *Newburyport* is also an important fishing town, building many ships likewise.

31. **Rhode Island**, though the smallest state in the Union, is relatively the most important in its manufactures, especially of cotton and woollen goods. Laurentian strata form a large portion of the state, which is in consequence rough and broken; the coast is often low, sandy, and swampy. Carboniferous strata, containing exceedingly hard anthracite coal, are also found.

Agriculture takes the form chiefly of dairy farming and market gardening to supply the numerous cities of the neighborhood. The *Fisheries* are important, but are carried on mainly to supply New York with fresh fish.

Cities.—Manufacturing towns and villages are very numerous. *Providence* and *Newport* are the capitals of the state; the latter, on Newport island, is a famous watering place, the shore shelving off very slowly. *Providence* (population 109,857) is one of the important cities of the United States; it lies on a little arm of the Narragansett Bay, a body of water that penetrates deeply into the state. Its commerce, both foreign and coastwise, is quite extensive; its manufactures are very great, including, beside the ordinary manufactures of New England, plated and silver ware. Brown University is situated in this city. *Bristol* is the chief seaport.

32. **Connecticut** resembles Rhode Island physically and in the character of its agricultural pursuits. The Appalachian ranges in the west are very low, but make the country broken and hilly, a feature that characterizes the east of the state also, but to a less degree. The minerals that have been mined are *iron ore*, *marble*, and *brown sandstone*, the last largely employed as fronts for buildings, especially in New York.

The numerous water-falls are utilized to such a degree, that, in the extent of its manufactures, this very small state is unsurpassed, and in value of its aggregate products is excelled only by six. It supplies nearly half of all the hardware, more than half of all the plated-ware, and nearly all the pins and clocks used or exported by the United States. In the number and variety of small articles manufactured, this state takes the lead.

Cities.—*Hartford*, the capital, at the head of navigation on the Connecticut River, is a finely-built, compact city. It is well known for the great amount of money that it has invested in the insurance business. Its characteristic manufactures are machinery, fire-arms, sewing-machines, and plated-ware; but it has all the other leading New England manufactures. *New Haven*, the largest city in the state, and a seaport, is the seat of Yale college, which holds equal rank with Harvard college. *Bridgeport*, *New London*, and *Stonington* are the chief ports, all having lines of palace steamers to New York.

MIDDLE ATLANTIC STATES.

33. The second group of Atlantic States comprises New York, New Jersey, Pennsylvania, Delaware, Maryland, and Virginia. These in climate and natural productions stand midway between the cold-temperate New England States, and the sub-tropical South Atlantic States.

The Appalachians, low and narrow throughout southern New England, here become much more massive, and have their mineral wealth in its greatest perfection.

The *Climate*, except in the northern part of New York, cannot be called extreme; the changes of temperature are never very sudden or very violent; the heat, though not more intense than farther north, is, however, more continuous; in winter, except in the mountains and in New York generally, snow usually gives place to rain, or if snow falls, it lasts but a short time.

The *Vegetation* is not different as a whole from that of New England, but there are some productions, either not found farther north, or not found in perfection,—sweet potatoes, peaches, grapes, and melons.

The *Industries*, instead of being confined to two or three leading kinds, as in New England, are of all kinds. The states of this group hold the first or a leading position in agriculture, fruit raising, stock raising, mining, fishing, manufacturing, lumbering, and shipping. The manufactures differ but little from those of New England, excepting that cotton and woollen goods do not have the same prominence as in New England.

Railroads are very numerous, and *Canals* also, especially in the northern states of the group.

In *Education* and general intelligence the Middle Atlantic States are but little behind the New England States. The universities of Cornell (at Ithaca, New York), New York, Princeton, and Johns Hopkins (at Baltimore), take high rank, being in many respects scarcely, if at all, inferior to Harvard and Yale of New England.

The great wealth, population, resources, and industrial and commercial activity of New York and Pennsylvania, give these states an important influence in the general politics of the country.

34. **New York** is one of the largest, and in many respects, the most important of the Middle Atlantic States. Its surface characteristics are varied; the north is occupied by the Adirondacks, a spur of the Laurentian rocks

of Canada, which rise into many high hills or mountains, Mount Marcy, the highest peak, reaching an elevation of 5,402 feet. Southward of this lies a more fertile country, but broken by the Appalachians. The centre and west of the state is plateau in character, the southern side being the highest and sloping off into Pennsylvania; but the northern side terminates in a limestone escarpment, not far from Lake Ontario,—the same escarpment that crosses into Ontario at Queenston. Waterfalls, in consequence, exist on all the streams entering the lake from this region.

The whole of the plateau region, as well as the valley of the Mohawk lying at the southern boundary of the Laurentian country, is fertile and well cultivated.

Of the *Rivers* other than the Hudson (see sec. 20), the *Genesee* in the west is the most important; its lower course is through the most fertile land in the state—the Genesee valley. There are falls on the river, one over the escarpment at Rochester is about a hundred feet high; all are utilized in driving machinery. The *Mohawk* is not a navigable stream, but furnishes important water-power; several of the larger rivers of the states to the south,—the *Delaware*, *Susquehanna*, *Ohio*, and others,—have their upper valleys in New York. The *East River*, really a strait, connects New York Harbor and Long Island Sound. In this river, opposite the upper part of the city, is the famous “Hell Gate,” once a dangerous tidal rapid, occasioned for the most part by rocks in the channel.

Agriculture is a leading industry, especially of the western half of the state; in dairy products, in the growing of fruit, potatoes, buckwheat, hay, and hops, New York surpasses all other states; grapes are grown extensively along the Hudson and in the lake districts of the west-centre, peaches in the west generally. Long Island and the districts bordering on the Hudson, are largely given up to market gardening and city dairying.

The *Mining* of iron-ore is extensively pursued in the Laurentian country, and the quarrying of marble and building stone in the Appalachian region.

The *Fisheries* of Long Island are valuable, but in the main the fish caught are taken fresh to the markets of New York; oysters and other shell-fish form an important part of the fisheries.

In aggregate value of *Manufactures* New York far surpasses all other states. It produces a large number of important articles, but has none that may be called characteristic, such as the New England States and Pennsylvania have, excepting the manufacture of flour and the refining of sugar and molasses; in these it ranks first among the states. Outside of the large cities manufacturing is pretty evenly distributed.

In *Foreign Commerce* this state has no equal. The amount of shipping owned in New York is greater than that owned in any other state.

There are many *Educational Institutions*—Normal Schools, Medical Schools, Colleges, and Universities.

The *Railroads* are numerous—all centering in New York; those leading from Canada are the Erie, New York Central, and another from Montreal. There are several *Canals*, the chief being the Erie canal from Buffalo to Albany, and the Champlain canal from Lake Champlain to the Hudson at Albany.

Cities.—*New York* (population, 1,206,300) is the largest city in the New World, and in wealth and commerce is surpassed only by London and Liverpool in Europe. The harbor is capacious and safe, although the entrance to it, called the “Narrows,”—a passage between Long Island and Staten Island six miles below the city—is shallow, and at low water cannot be passed by deep-draught vessels. Staten Island, five miles below the city, completely shelters the harbor from all southerly storms. The city is situated almost wholly upon a slightly elevated tongue of land,—in reality an island, called Manhattan Island,—formed by the Hudson and East Rivers at their entrance into the northern part of the harbor. An extensive water frontage is thus afforded for commerce. The manufactures are numerous and important—refined sugar and the various preparations of tobacco being leading commodities. New York is a commercial rather than a manufacturing city; its excellent position at the mouth of a navigable river flowing from a long distance inland and artificially extended to the great lakes, makes it the point from which a vast trade in both imports and exports is carried on with foreign countries. It has, in fact, half of the foreign commerce of the United States.

Within a radius of ten miles from near the junction of the Hudson and East rivers are Brooklyn, Jersey City, Hoboken, Newark, Elizabeth, Long Island City, and numerous smaller towns, the total population of which, together with that of New York, is over 2,000,000.

There are many cities of large size in New York. *Albany*, (population, 90,758 in 1880) the capital, is situated 150 miles up the Hudson, at the head of river navigation; it has numerous manufactures and an important transfer trade in cattle, lumber, and grain. *Brooklyn*, on the East River opposite New York, has a water frontage of ten miles, and contains a Navy Yard and several refineries for sugar and petroleum. *Buffalo* is the third city in the state; besides its important manufactures, it does a very large transfer trade. A fleet of steamers and sailing vessels brings to its port grain, lumber, and cattle from the west; these are transferred to the railroads and the Erie Canal to be taken to New York and Boston. *Rochester*, seven miles from the mouth of the Genesee river, manufactures flour very extensively, and exports great quantities

of field and garden seeds. *Syracuse* and *Onondaga* contain the chief brine wells. *Oswego* and *Ogdensburg* have an important trade with Canada in grain and lumber. *Troy*, *Utica*, *Auburn*, and *Saratoga*, the latter a summer resort on account of its mineral springs, are important inland cities.

35. New Jersey has its north and north-western part in the broken Alleghany country; the rest is the low, sandy coast region with characteristic marshes; islands similar to the coast region fringe the shore everywhere. In the valleys of the highlands the soil is fertile; elsewhere it is very light but well adapted for fruit and for market-gardening. *Iron* especially is largely mined, and *copper* to some extent. Building-stone is extensively quarried; sand suitable for glass-making, and clay for earthenware, exist in large quantities.

Agricultural pursuits are in a great measure confined to the cultivation of orchard and small fruits,—peaches, grapes, strawberries, cranberries, &c.,—and of garden vegetables. Agriculture proper, including the raising of grain and of common and sweet potatoes, holds an important place, as do also stock-raising and dairy-farming.

The *Manufactures* are similar to those of New York, but include silk goods, earthenware of all kinds, and glassware. The aggregate value of the manufactures in 1880 was nearly \$200,000,000.

Cities.—*Trenton*, the capital, at the head of navigation on the Delaware river, is said to manufacture more earthenware than all the rest of America. *Newark* manufactures clothing, jewelry, and silk goods, and *Patterson*, at the Falls of the Passaic, locomotives, silks, and cottons. *Jersey City*, at the mouth of the Hudson, is almost a suburb of New York City. *Long Branch*, *Cape May*, and *Atlantic City* are fashionable watering-places. *Princeton* is the seat of Princeton University.

36. Pennsylvania.—The Appalachian Mountains, bearing very many local names, occupy the greater part of this state; only a narrow strip in the east is alluvial. The parallel mountain ranges enclose several valleys, some of which are quite narrow, others are from fifteen to twenty miles in width. Some of the ridges have flat table-lands on their summits; many have sharp crests with rocky sides, and most are covered with timber.

The *Anthracite Coal* region is an irregular tract one hundred miles long and thirty broad, lying between the east branch of the Susquehanna and the Lehigh rivers, the total area being about 472 square miles. The south-western part of the state, between the Alleghany mountains and Ohio river, is the great iron and bituminous coal region. Petroleum and salt abound in the north-western part of the state. Large quantities of

slate are quarried in the Delaware and Lehigh valleys. The south-eastern part of the state has no coal.

The valleys and the south produce grain, grass, and fruit. The annual aggregate value of the grain, hay, potatoes, and tobacco is very great, but is exceeded by that of the fruit, animal and garden products.

The *Delaware* and *Ohio* rivers, and *Lake Erie* are the great natural trade routes of the state.

In *Manufactures* Pennsylvania holds a very prominent place; in 1880 the total value of these was \$745,000,000. In the same year half of the iron and steel of the United States was manufactured here, the value having been nearly \$146,000,000. In the manufacture of glass, mixed goods, and chemicals, Pennsylvania ranks first.

Cities.—*Philadelphia*, one hundred miles from the ocean, at the confluence of the Delaware and Schuylkill rivers, is the second largest city in America; it has a very long water frontage on the former river, which is here navigable for the largest ocean steamers; it is also the principal port of the anthracite region. Its foreign trade is very large, West India produce forming a leading feature. In 1880 the population was 847,170, of which nearly a quarter were engaged in manufactures.

Harrisburg, the capital, on the Susquehanna river, has ready access to the coal and iron regions, and is largely engaged in the manufacture of Bessemer steel and other products of iron. *Pittsburg*, at the confluence of the Alleghany and Monongahela rivers, is the centre of the coal and iron trade. It has extensive manufactures of iron and steel, foundry products, machinery of all kinds, and glass; its trade down the Ohio and Mississippi is very great. *Erie*, on the shore of Lake Erie, has an excellent harbor, and exports large quantities of coal, iron, and petroleum.

37. *Delaware* is undulating in the north, but elsewhere it is the low characteristic coast region. The soil is generally light but, as in New Jersey, is well adapted

for fruit of all kinds, especially peaches, melons, and small fruits, and for garden vegetables. The raising of these constitutes the chief part of the agriculture, though wheat and Indian corn are important crops.

The *Manufactures* are of the ordinary kind, preserved fruits forming a leading article.

Cities.—These are *Dover*, the capital; *Wilmington*, the largest city, a very active manufacturing town in which most of the manufactures of the state are produced; of these the chief are gunpowder, iron and articles of iron, and ships.

38. *Maryland*.—*Maryland* is divided by the Chesapeake Bay; the east is the characteristic low, sandy plain, while the west, at some distance back from the Bay, rises into the Appalachian ridges. These ridges are often steep and bold, but enclose valleys of great fertility.

The swampy districts produce a good deal of timber, including white oak, hickory, cedar, and cypress. The *Agriculture* is the same as that of Delaware and New Jersey, including, however, a much more extensive cultivation of tobacco,—the tobacco region being to the west of the Chesapeake Bay.

The *Minerals* are important, coal and iron be-

ing extensively mined.

The *Fisheries* are extremely valuable, especially the oyster fishery. In 1880 oysters to the value of nearly \$5,000,000 were taken in Maryland alone. Immense quantities of *Game*, especially ducks and geese, frequent the waters of this state.

The *Manufactures* are similar to those of the rest of the group of states, but canned fruits and oysters constitute leading products.

Cities.—*Baltimore*, (population, 332,318) fourteen miles from Chesapeake Bay, is an important market for flour, oysters, fish, tobacco, and canned fruits. It has an extensive trade with Liverpool and Bremen. *Annapolis*, a small city, and seat of the U. S. Naval Academy, is the capital.

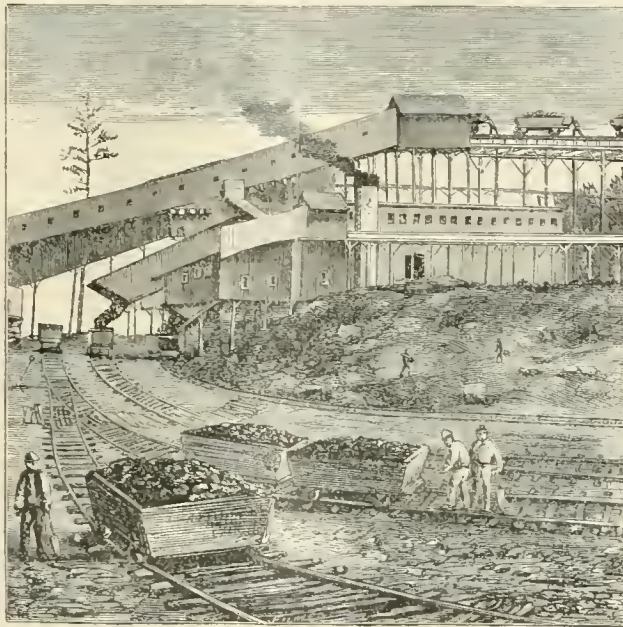


FIG. 67.—COAL BREAKER AND SHUTE

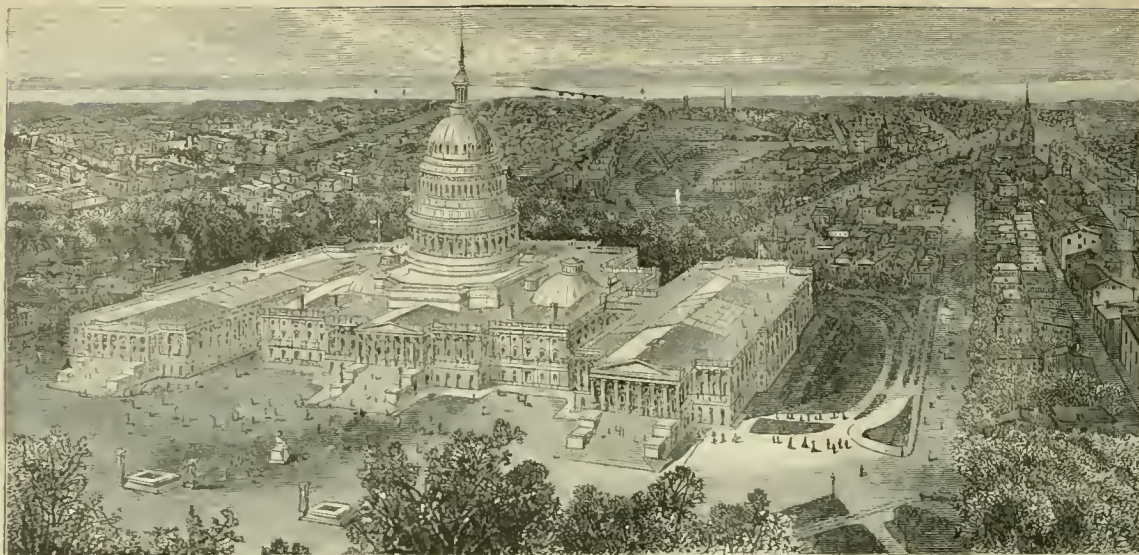


FIG. 68.—THE CAPITOL—WASHINGTON.

39. **Virginia.**—The physical features, productions, and industries of Virginia embrace all the varieties common to this whole group of states; the great swamps in the south-east add a characteristic of the South Atlantic States. The mountains, which sometimes reach the height of 5,000 feet, and are, as a rule, forest-clad, contain coal, iron, slate, marble, and building-stone. The winters are short though sometimes cold; the summers are pleasant and healthy.

The climate and productions of the south-east portion are those of the coast region. In places the climate is affected by several large swamps, among which are the Chickahominy, White Oak, and Great Dismal swamps; the last is thirty miles long and ten wide.

The great fertility of the valleys and of nearly all the eastern slope, makes agriculture the leading industry, while the bays and rivers afford excellent facilities for commerce. In the production of tobacco Virginia is the second state in the Union.

Cities.—*Richmond*, on the James river, is the capital and the largest city. It is the seat of extensive tobacco factories, warehouses, flour mills, and iron works. *Norfolk*, on the Elizabeth river, ranks next to Richmond; it carries on a large export trade, and with *Portsmouth*, is the most important naval station in the United States.

40. **The District of Columbia.**—This district, physically the same as Maryland, contains seventy square miles. It is governed by a Board appointed by the

U. S. Congress. Its chief importance is due to its containing *Washington*, the capital of the United States, (population, 147,293).

This city is situated on the Potomac; it is handsomely laid out and contains many important buildings, among which are the Capitol, the Smithsonian Institute, the Observatory, the White House of the President, and several museums.

SOUTH ATLANTIC STATES.

41. These states comprise North Carolina, South Carolina, Georgia, and Florida.

They have the low coast section at its maximum breadth, and the Appalachian mountains at their maximum height. The marshes and swamps, found everywhere on the coast, are here developed to their greatest extent.

The ordinary Appalachian minerals seem to be abundant, but only iron and copper are mined; gold also is found, especially in North Carolina.

The *Climate* varies according to the height of the land; in the coast district it is warm and moist, and consequently somewhat unhealthy; in the mountains the comparatively slight elevation and the nearness to the tropics, produce pleasant summers and mild winters, snow not lasting long. The middle section is much drier than the coast division.

The *Vegetation* in the low district here becomes characteristic of the sub-tropical region,—live-oak (ever-green), magnolia, juniper, palmetto, cypress, and pitch pine, along with many medicinal plants; in the higher regions it is of a more northern type. The live-oak and pitch pine are exceedingly valuable in ship-building, and are largely exported. Of cultivated plants, cotton and rice are characteristic.

Of the *Industries*, agriculture is the chief; the cultivation of cotton and of rice hold by far the most important position; the former, to a large extent, is confined to the low district, the latter wholly so. The low islands along the coast produce what is termed the "sea-island" cotton, the long, silky fibre of which makes it the most valuable of all cotton. The soil of the higher parts of the coast region is sandy, and only moderately productive; it yields, however, excellent crops of sweet potatoes, and is specially adapted to grape culture. In the southern part of this subdivision figs and pomegranates are grown. The two higher regions produce Indian-corn and all kinds of fruit in abundance, and also large quantities of wheat and oats; excepting in North Carolina, very little tobacco is cultivated. In all these states the raising of early fruits and vegetables for the northern market is an important branch of agriculture.

Lumbering is also an important industry; live-oak and pitch pine timber constitute the chief export, though the value of sawn material in 1880 was from \$2,000,000 in North Carolina, to \$5,000,000 in Georgia.

The spring *Fishery* in the shallow waters of the North Carolina coast is very valuable, for the Arctic current is felt at Cape Hatteras.

Manufacturing is limited; excepting the production of lumber and the preparation of rice for market, it is largely confined to the extraction of tar, turpentine and resin from the pine trees, and oil from the cotton seed.



FIG. 69.—BRANCH OF THE COTTON PLANT.

There is also considerable manufacturing of cotton and woollen goods, and of flour.

Education is in a much more backward condition than elsewhere in the Atlantic States; but of late years schools have greatly increased in number and efficiency.

Everywhere the *negro population* is very large; in 1880 it amounted to over 531,000, the white population being somewhat over 867,000. In North Carolina the negroes are least numerous; in South Carolina they form nearly two-thirds of the population. Among this class the greatest amount of ignorance prevails.

42. North Carolina.—This state has no special characteristic in physical features, in climate, productions, or industries apart from the rest of the group.

The *Cities* are all small. *Raleigh*, the capital, is but a small town. *Wilmington*, at the head of the estuary of the Cape Fear river, is the chief town of the state. *New Berne* is the next in importance.

43. South Carolina.—South Carolina, politically, has always been one of the leading states of the Union; commercially it is inferior to both North Carolina and Georgia.

The *Cities*, as in North Carolina, are small excepting *Charleston*. This city, among the finest in the United States, has a spacious harbor, one of the two in the state capable of admitting large ships. It is one of the chief commercial cities in the South Atlantic States. The population in 1880 was 50,000. *Columbia* is the capital.

Beaufort, on Port Royal Island, has the other harbor accessible to ocean-going vessels.

44. Georgia excels the other states of the group in its manufactures, of lumber and cotton especially, and in its coal and iron mines.

The *Cities* of considerable size are more numerous than in the other states of the group. *Atlanta*, the capital, (population, 37,500 in 1880) nearly doubled its inhabitants between 1870 and 1880. It is one of the most active cities of the south, having a very extensive inland trade. Its situation at the end of the Appalachian mountains, over a thousand feet above the sea, gives it a very fine climate. Its manufactures are varied, the chief being iron from the ore mined in the vicinity, flour, cotton goods, and paper.

Savannah is the chief port of the state and the principal commercial city of the South Atlantic States. It has a good harbor, deeper and better than that of Charleston, the water, as is usual on this coast, being shallow at the entrance. In value of its export of raw cotton it is the second city in the Union. It also has a large trade in lumber and rice.

45. **Florida.** in many respects, differs materially from all the other states of the Union; only the northern part has the geological characteristics of the neighboring states; elsewhere the surface accumulations are partly marine but also partly fresh water or open air accumulations, the rock beneath being coralline. The most of the state is West Indian in character.

The surface of the peninsula, nowhere more than two hundred feet above the sea, is varied by slight swells and shallow depressions; the latter often contain lakes or swamps of considerable extent. The southern part of the peninsula, except the coast, is practically unknown, no exploration having as yet been attempted; it is said, however, to be in the main swampy, consisting of "everglades." The coasts are characteristic—lined with low islands or peninsulas, often of great length, running parallel to the coast and formed of sand, broken shells and coral; long shallow stretches of water in consequence exist behind the islands; the St. John's river in its lower course is merely one of these inlets.

The *Climate* is in general moist and very equable, for the seas maintain a considerable uniformity of temperature throughout the year; the coasts and low places are unhealthy in summer.

The *Vegetation* is very luxuriant everywhere; besides that of the states to the north, it contains types belonging to the tropics—mahogany, lignum-vitæ, satinwood, cocoanut, and others; while the cultivated tropical plants consist of sugar-cane, oranges, lemons, pine-apples, bananas, figs, olives, and others of a decidedly West Indian character.

The *Animals*, along with those common further north, include the alligator and the turtle, and several new varieties of poisonous serpents. Game is very abundant, as is also fish.

The special features in the *Industries* consist in the raising of oranges and other tropical fruits, and in the sponge fishing of the south. The former is rapidly rising in importance.

The *Cities* are small. *Tallahassee* is the capital; *Jacksonville*, on the St. John's river, is the largest town; *Key West*, on one of the dangerous islands—the "Florida Keys"—to the south, carries on sponge fishing; *Pensacola* has a large lumber trade; *St. Augustine*, the oldest town in America, is a celebrated winter resort for invalids from the north.

CENTRAL DIVISION.

46. **Physical Features.**—Away from the neighborhood of the mountains the great central plain presents little variety in physical conformation; there is a vast extent of country either level or very gently undulating; except in Missouri and Kansas there is no elevation deserving even the name of hill. The regions near the mountains have all the characteristics of plateaus—the plateau of the western side being similar in character to the western level of the Canadian plain. The

whole plain has a very gradual rise northward from the Gulf of Mexico, till, near the Canadian boundary, it reaches an elevation of about nine hundred feet above sea level. Where the influence of the lateral elevations ceases to be felt the two great rivers, the Missouri and the Ohio, are situated. Within the triangle enclosed by these two rivers the slope of the land is altogether southerly; elsewhere the slope is directly toward the central valley—a peculiarity due to the retreating character of the lateral rises in combination with the general elevation of the country northward.

47. The **Minerals** are highly important; in addition to the *coal*, *iron*, and *copper* already referred to, *zinc*, as well as *lead*, is abundant, especially in the coal area of Missouri; *marble* and *limestone* are found everywhere except in the Gulf States; *petroleum* and *brine* wells occur in the states bordering on Pennsylvania; Michigan, however, produces over half of the salt made in the United States; the *precious metals* are met with in large quantities only in Dakota.



FIG. 70.—A CREVASSE.

48. **Rivers.**—The vast extent of this interior country, its slope towards one common but distant depression, and its abundant, though not excessive, rainfall, give rise to rivers remarkable for their length of course and for their volume of water.

The *Mississippi* has its head waters in some small lakes in northern Minnesota, in a Laurentian country; there is a sudden fall of about seventy feet at Minneapolis, but from that point to the Gulf of Mexico there is no hindrance to navigation, although in places the current is somewhat strong. The direct distance from the head-waters of the river to its mouth is about 1,300 miles, but so great is the sinuosity that the length is increased to at least 2,300 miles. Throughout the greater part of its course the river lies in a flat and usually perfectly level valley of rich alluvial soil, called "bottom" land, bounded by bluffs from 200 to 500 feet high; the strata in these bluffs are the same on both sides of the river, though the valley is in places over sixty miles wide. The valley has been formed by erosion. In the lower part of the course the banks, owing to the deposition of sediment, are higher than the ground immediately beyond them, so that during periods of flood the water overflows and covers the surrounding country. Many hundred miles of embankments, or *levées*, have been erected along the river to protect the country from these inundations. "The whole area of the delta, which begins just below the Red river, is about 15,300 square miles; about one-third is a sea marsh, only two-thirds lying above the level of the Gulf."

(See Part I, "Land Surface of the Earth," section 2 (*Sediment*), 20, 23, 26, 28, and "North America," section 11.)

The other great rivers, flowing from the western plateau region, are characterized by phenomena similar to those of the Mississippi. They all have rapid currents where they pass through the plateau region; but as this region is dry and treeless the water in the late summer and the fall is very low. Their affluents, though often several hundred miles long, are seldom navigable even in full water. The *Missouri* is over 3,000 miles in length, the *Arkansas*, 2,000, and the *Red* about 1,500. The *Rio Grande*, having its head water in central Colorado, nearly 2,000 miles from its mouth, is throughout a plateau river, and as it is for the most part in the dry region, its waters are shallow.

On the east the only important affluent of the Mississippi is the *Ohio*, about 1,000 miles in length; its volume of water is said to be greater than that of the *Missouri*, but subject to very great fluctuations. The river, which in the low-water season is not navigable in the upper part of its course, has but one obstruction, a rapid near Louisville; this involved the construction of a canal. The other rivers from the Alleghanies are, excepting the *Cumberland* and *Tennessee*, important affluents of the *Ohio*; all have numerous rapids and falls with stretches of deep water. The streams running off into the Gulf of Mexico are generally free from obstructions; during the season of full water they can be navigated by steamers almost to their source.

49. The **Climate** of the central division, like that of the Atlantic seaboard, varies from the equable semi-tropical climate of the Gulf of Mexico to the extreme climate of Dakota and Minnesota. In the Mississippi basin snow occasionally falls as far south as the Gulf of Mexico; on the coast of Texas ice is formed even to the border of Mexico, while the lakes modify the climate of the states that border on them. (See "North America," sections 13 and 14.)

50. **Vegetation.**—Forest growth is found abundantly all through this division except in the states of the western border. The states of the north contain the greatest amount of forest and produce most lumber. Pine and spruce are the characteristic trees of the north; walnut, oak, hickory, and cottonwood of the centre, and pitch pine of the south. (See section 6.)

51. **Industries.**—This region is preëminently *Agricultural*; all the hardy grains grow to perfection—wheat, oats, rye, barley—from the Canadian border to the Gulf States; while Indian-corn, from the latitude of northern Illinois to that of southern Tennessee, attains a luxuriance and productiveness nowhere else equalled. The region of Indian-corn is also that of tobacco, followed southward by cotton, sugar-cane, and rice, while sweet potatoes are cultivated everywhere south of the fortieth parallel. The rearing of live-stock, except in the southern part of the Mississippi basin, forms an important industry,—it is the only important industry on the treeless, grass-covered prairies and the plateau country, from the Mexican to the Canadian border.

Mining is extensively carried on in the Alleghany region, as well as in the lake region and in the neighborhood of the Ozark Mountains; *Lumbering* is a leading industry of the north; it is also important in the low-lying districts of the southern Mississippi basin and the Gulf coast.

The *Manufactures* are all connected with the natural productions, and are everywhere important except in the Gulf states; flour, meal, preserved meats, leather, agricultural machinery, lumber, and distilled liquors in the grain-growing states; iron, steel, and heavy machinery in the iron and coal producing states; oil-cake and oil from cotton seed, turpentine and tar from the pines of the Gulf coast, with some refining of sugar and molasses, and cleaning and polishing of rice, in the southern section. (See sections 4–7.)

52. In **Education** the northern section, settled largely by emigrants from the North Atlantic States, is in advance of the southern section; but this section too has lately made excellent progress.

The **Cities** of the northern half of this division of the United States are both numerous and important; their situation is invariably where the greatest natural conveniences exist for commerce, either domestic or foreign; with scarcely an exception they are found on the rivers or the lakes. All these cities are rapidly growing in population and importance; the greater part increased in population from fifty to eighty per cent. between 1870 and 1880; several a hundred per cent., and one at least over three hundred per cent. All contain manufactures of the characteristic productions of the state. The cities of the southern half, on the other hand, are less numerous, and with the exception of New Orleans, are but small; Nashville, in Tennessee, with a population of over 43,000 in 1880, is much the largest of these. This city, too, is almost the only one, excepting New Orleans and the cities of Texas, that shows an increase of population instead of a decrease between the dates referred to.

53. **Michigan** is divided by the lakes and forms two peninsulas; the southern peninsula, the seat of the population and industries, is level, with a fertile soil of sandy loam everywhere except in the north; the northern peninsula is rugged and uninviting, but contains the great iron and copper mines.

Of the cities, *Detroit*, (population, 116,340) the largest city, and one of the great cities of the United States, is engaged extensively in the transport trade between the west and east; much of this trade passes through Canada. The extensive water front on the Detroit river—here a fine deep stream over half a mile wide—is fully utilized in the extensive and rapidly increasing commerce of the city. *Saginaw* and *Bay City* have extensive manufactures of salt and lumber. *Ann Arbor* has a university. At *Port Huron* the Grand Trunk railway crosses from Sarnia into the United States.

54. **Wisconsin** is of much the same character as Michigan in surface and soil; the northern part is a

Laurentian region, rough, poor, and thinly inhabited; there is much poor, sandy soil in the centre of the state.

The chief city is *Milwaukee* (population, 115,587) with a fine harbor on Lake Michigan; it is one of the large cities of the Union. Its export of wheat and flour is very great, being second only to that of Chicago.

55. *Minnesota* has a somewhat uneven surface; there is a rapid rise of the land from Lake Superior, followed by nearly as rapid a fall into the valley of the Red River. The northern portion of the state is Laurentian and well wooded, containing innumerable lakes; the southern portion is generally very fertile.

St. Paul, the capital, is at the head of navigation on the Mississippi; its manufactures are important; the city more than doubled its population between 1870 and 1880. *Minneapolis*, the largest city in the state, is situated at the falls of St. Anthony, ten miles from St. Paul; the population increased from 13,000 in 1870, to nearly 47,000 in 1880; the suburbs of this city and of St. Paul are almost united. Lumber and flour are the leading products. The city has been created by the falls. *Duluth*, at the head of navigation on Lake Superior, has a large trade on the lakes.

56. *Dakota Territory* in its northern part, is but a continuation of Manitoba and Assiniboia; it contains the rough "Coteau de Missouri," and a characteristic region of salt or alkaline lakes to the east; the central and north-east portions have a "rolling" surface—the peculiar feature of the plateau states; in the south-west are the barren "bad-lands" and the Black Hills—the most easterly outliers of the Rocky Mountains. The climate is dry; high winds are very frequent.

57. The states of Ohio, Indiana, Illinois, Iowa, Nebraska, Missouri, and Kansas have superficial characteristics and natural productions very nearly alike; the central district is low-lying prairie for the most part, the east and the west approach a plateau in character. The only elevations are the Ozark Hills in Missouri, famous for their iron, especially Pilot Knob and Iron Mountain. West of the Mississippi the climate is dry, so much so that barrenness of soil results from it in the extreme west, and a very uncertain rainfall in many other places. The soil is naturally fertile, the best being the "bottom lands" of the numerous rivers.

Cities.—Several of the most important cities of the country are found in these states.

In Ohio, *Cincinnati*, (population, 255,139), is among the largest in the Union; its trade both by water and by land is very extensive; of its numerous industries meat-packing, distilling, and brewing are the most extensive. *Cleveland*, with a fine harbor, is next in importance; it has a large lake trade in coal, petroleum, iron, flour, and grain. *Toledo* excels Cleveland in its exports of live-stock, flour, and farm produce in general.

In Indiana, *Indianapolis* is important in milling and in the industries attached to mining.

In Illinois, *Chicago*, though only fifth in size among the cities of the United States, ranks next to New York in commercial importance; it is the largest grain market in the world. The manufactures, all characteristic of the division, were valued, in 1880, at nearly \$250,000,000, salted meats alone amounting to one third of this sum. The position of Chicago at the head of Lake Michigan, a lake that penetrates deep into a wide-extended country rich in natural resources, insures to that city a commercial preëminence. The growth of Chicago has been very rapid; in 1850 the inhabitants numbered 30,000, in 1880 over 503,000.

In Missouri, *St. Louis* (population, 350,518) is the largest and in every respect the most important city of the Mississippi valley, and the only important city west of the Mississippi. Situated about twenty miles below the confluence of the Mississippi and Missouri rivers, it is the centre for all the trade with the vast agricultural, stock-raising, and mining regions of the west.

58. West Virginia, Kentucky, and Tennessee, are mountainous in the east, and produce the characteristic minerals, including petroleum and salt in West Virginia; in the west they are slightly undulating, the soil being everywhere highly productive. Stock-raising is the prominent industry in the elevated country.

One city, *Louisville*, in Kentucky, is among the leading cities of the country. Its trade in tobacco, pork, and flour is very large; while its manufactures, similar to those of the other great cities, are both numerous and important. The population of the city in 1880 was 123,758.

In Tennessee, *Nashville* and *Knoxville*; and in West Virginia, *Wheeling*, are the chief towns.

59. Of the remaining states of the central division, the southern half of Alabama and Mississippi, nearly all Louisiana, and a broad belt of Texas, are comprised in the low-lying (or *post-tertiary*) coast division of the United States; the same formation extends up the Mississippi to the mouth of the Ohio, where the elevation is not much over 300 feet above the sea-level. The boundary westward is marked by a low range of sand hills; beyond this, at a distance of over a hundred miles, the country rises gradually from the prairie into the plateau region. In the northern part of Alabama the Alleghanies terminate, and in consequence the country is rough and broken; northern Arkansas contains part of the Ozark Hills, which also continue on into the Indian Territory. North-western Texas, especially in the large tract known as the "Staked Plain," is dry and barren, while the central part is a grassy plateau with clumps of forest and wooded river-courses.

60. The *Indian Territory* is owned by the Indians, the greater part of whom were transported by the United States government from the states east of the Mississippi.

Arkansas has no city of importance. In *Alabama*, *Mobile*, the chief sea-port on the coast, is well situated for trade; it is

an important town ranking third in the United States as a cotton market.

In **Mississippi**, *Vicksburg*, on a high bluff, is the chief town; its trade is almost wholly in cotton.

In **Louisiana**, *New Orleans*, about a hundred miles from the mouth of the Mississippi, is one of the most important commercial cities in America; in 1879 its exports were valued at over \$81,000,000; cotton alone forming seven-eighths of the whole. Within the last few years the export of cattle, grain, and flour has assumed large proportions. The city is below the high-water level of the river, and has to be protected by levees or dykes. In 1880 the population was over 216,000.

In **Texas**, *Galveston* is the only important city; it is on a low island and has a shallow entrance to its harbor. Its exports are for the most part cotton and hides.

THE ROCKY MOUNTAIN PLATEAU STATES AND TERRITORIES.

61. Physical Characteristics.—From the plateau, which is bounded by the Rocky Mountains on the east and the Sierra Nevada with the Cascade Mountains on the west, rise very many short ranges that run in a general parallel direction to the main ranges; by this means are produced numerous long and sometimes narrow valleys. Many cross ranges occur, and where in intersecting a valley they enclose a portion of it, a "park" is formed, often of exceeding beauty and fertility. Of the parallel ranges the chief are the *Wausatch* in Utah, the *Humboldt* in Nevada, the *Bitter-Root* between Idaho and Montana, and the *Blue* in Oregon; of the cross ranges, the *Uintah* in Utah is the best known.

The plateau is highest at its eastern side, sloping off very gradually to the west. Within the plateau there are three main cross depressions; one in the north, another in the middle, and a third in the south. The waters of the north and the south depression find their way to the ocean; but those of the middle depression enter salt lakes or are absorbed in the deserts, forming salt marshes. This tract, known as the *Great American Basin*, occupies the eastern half of Nevada, and much of Utah and northern Arizona; the southern part is altogether a barren desert, the vegetation elsewhere being scanty. The northern basin is comparatively level, the other two are broken.

While almost everywhere exist evidences of terrific volcanic action in former ages, only here and there throughout the plateau do active volcanic phenomena occur; Mount Hood in Oregon emits some smoke; mud-volcanoes are found in Colorado and elsewhere; and the

greatest geysers known exist around the head waters of the Yellowstone. This Yellowstone region, in north-western Wyoming, which contains lakes, mud-volcanoes, hot-springs, water-falls, and magnificent mountain scenery, has been set apart by the United States government as a *National Park*.

The eastern base of the Rocky Mountains and the country beyond are identical in character with the region similarly situated in the Canadian North-West,—a series of "foot-hills" and a high plain or plateau deeply scored with water-courses often wooded, eroded by rivers and other agents, dry, and, where not absolutely arid, covered with rich, succulent grass, with a soil requiring only more water to make it highly productive.

West of the Sierra Nevada and Cascade Mountains the low coast ranges enclose fertile valleys and are joined to the main ranges by short spurs. The Sierra Nevada lie wholly within California, and, with a coast-range, enclose the low-lying central California, one of the finest and most fertile valleys in the world. The collected waters of the innumerable streams, usually only winter torrents descending from the Sierra, are carried off to San Francisco Bay by the Sacramento and San Joaquin (*wau-keen*) rivers.

62. Rivers.—In all the river-courses, whether through mountain passes or along valleys, there are deep gorges or cañons, sometimes, as in the lower waters of the Colorado, hundreds of miles long, having on both sides perpendicular walls of rock descending, in the Colorado, over 6,000 feet below the general surface of the country. Waterfalls are numerous, and often of great height and exceeding beauty. The Falls of the Yellowstone, and those of the Yosemite (*yo-sém-it-ē*) in east-central California, are especially remarkable. The great river of the south, entering the Gulf of California, is the *Colorado*; except in its lower course it is not navigable; it flows through a barren country. In the north the *Columbia* is navigable from its mouth for over 150 miles; several long, deep stretches of water, one 250 miles in length, occur between the various falls and rapids farther up on the river.

63. The Lakes are numerous, chief among which are *Great Salt Lake* (see Part I. "Land Surface of the Earth," sec. 31), *Utah Lake*—fresh water, with an outlet into the preceding, and *Pyramid Lake*.

64. Climate.—In central and southern California the climate is almost tropical, there being only winter and summer; the winter is the season of rain, the summer of drought; during the latter the ground is quite parched and vegetation burnt up. Cold winds are apt to fall suddenly from the mountains upon all parts of the valley. The heat is never very great, the oceanic winds preserving an equable temperature everywhere. (See "North America," sections 13 and 14.)

65. Productions.—Forest growth occurs where rain is abundant,—on the coast ranges, the western side of the Sierra Nevadas, and on the higher peaks of the

plateau ranges, and quite generally in Oregon and Washington. In the dry regions only cactus, sage, and some stunted shrubs are found. The river courses, where not through cañons, are generally wooded. The soil is highly productive where it obtains moisture from rain or melting snow, or from irrigation. Irrigation is very largely practiced, especially in California, and abundant crops of all the grains are raised.

66. Industries.—*Mining* is still the great industry of this region; the vast amount of its precious metals has had a marked influence on the population, wealth, and legislation of the country (see section 4). *Agriculture*, however, is now the chief industry of California and Oregon, the former state surpassing in some productions all others in the Union (see section 5). *Fruit Culture* has assumed large proportions in southern California—the grape, orange, lemon, fig, and others yielding excellent crops. *Stock-raising* is a leading industry wherever there is grass: California, Oregon, and the other states and territories along the Rocky Mountains, especially Montana, raise vast herds of cattle, while the first named state stands next to Ohio in yield of wool.

Manufacturing of various articles is carried on extensively in California; dried fruits, wine, and distilled liquors are sent east in considerable quantities.

67. Subdivisions.—In this division there are four states—Colorado, Nevada, California, and Oregon,—and the territories Arizona, New Mexico, Utah, Idaho, Wyoming, Montana, and Washington.

68. Cities.—In California is *San Francisco*, (population, 234,000), one of the great cities of the United States; its trade with the east by railroad, by the way of the Isthmus of Panama, and by Cape Horn, is very extensive; it is likewise the only port for trade to China, Australia, New Zealand, and the Pacific islands. Besides the trade in home productions the city has a large transport trade in tea and other articles from China and elsewhere. *Los Angeles*, in the region of the tropical fruit, is a famous resort for invalids; *Sacramento*, the capital, and *San José* are important towns. In Oregon, *Portland* has a large trade in flour, wheat, and lumber. In Utah, *Salt Lake City*, founded by the religious sect called Mormons, and still for the most part peopled by them, is a city of considerable size near the Great Salt Lake; the country is dry, but produces excellent crops, mainly through irrigation. *Carson* in Nevada, *Prescott* in Arizona, *Santa Fé* in New Mexico, *Denver* and *Leadville* in Colorado—all mining towns—are the other chief places.

69. Alaska.—This extensive region, formerly belonging to Russia, is but little known. The climate of the coast is milder than that of the inland, and very moist; the agricultural as well as the mineral capabilities are unknown; fish swarm in the waters, and form the only food of the coast Indians. Furs, dried fish, and oil are exported. *Sitka* is an Indian village with a few United States officials stationed in it. Forests exist all along the coast ranges, and in some places, it is said, on the banks of the *Yukon*, the chief river.

GREENLAND.

70. Except the western and the south-eastern coast almost nothing is known of this vast region. As far as has been ascertained the whole interior, at least north of latitude 67°, is covered with one immense glacier, but of what depth or of what height above the sea, it seems impossible to find out. Along both coasts the force of the waves breaks off enormous masses of ice from the glacier as it pushes into the sea, and these masses float away as icebergs. Even in the southern part July is the only month in which snow does not fall; the cold of winter is intense. Some potatoes and garden vegetables are grown in the south. There are no trees; only a few stunted shrubs of birch, willow, and elder are met with; some grasses are found along the sheltered fiords, but mosses and lichens are abundant. The seas abound in animal life of the largest kinds, which afford almost the only food of the native inhabitants:—different species of the whale family, including the white whale and narwhal; seal of several varieties, walrus, sea-lions, &c.; of the fishes, shaks, halibut, cod, salmon, and many others. Sea-fowl are innumerable. Of the land animals, reindeer seem to be plentiful, and are hunted in summer; the musk-ox, arctic fox, and polar bear are also found.

The exports consist in products of the marine animals, reindeer hides, and feathers of the eider duck.

The country is owned by Denmark. The inhabitants, about 10,000 in number, are nearly all Eskimos, some of whom are in part christianized; they live mainly on the west coast, and are quiet and inoffensive. Their winter houses are of stone, their summer ones consist of tents made of hide. Of the Danes there are not more than three hundred; they live in little villages along the best sheltered fiords of the west coast. The chief villages are Godthaab and Uppernavik.

MEXICO.

1. Extent.—The extreme length of Mexico is about 2,000 miles, the greatest breadth 750 miles; the narrowest part is the Isthmus of Tehuantepec, 140 miles. The area is given at about 760,000 square miles.

2. Physical Features.—Mexico is but a continuation of the western plateau of America, rising slowly towards the south till the maximum elevation of 8,000 feet is reached at the Isthmus of Tehuantepec. Apart from the mountain ranges the plateau here is remarkably level as a whole, both from east to west, and from north to south; no serious obstacles are presented to travel in the direction of the ranges; cross ranges exist mainly to the north-west, running down to the Gulf of California. There are several depressions in the plateau, the most remarkable of which contains the city of Mexico, and is surrounded by the most famous volcanoes in the country—Toluga, Popocatepetl, and Iztaccihuatl, over 17,000 feet high.

There are three ranges of mountains rising from the plateau: the eastern, or *Sierra Madre*, is the continuation of the Rocky Mountains; the western range is a continuation of the Pinaleno Mountains of the United

States; the central range, called by various names, though higher in its northern portion than the others, is the lowest of the three. The chief volcanic region is in the neighborhood of the parallel of nineteen, where lies Jorullo, the sudden rise of which in 1759 destroyed a fertile plain.

3. Coast Features.—The descent from the plateau to the coast, consisting for the most part of a succession of terraces, is everywhere rapid and everywhere difficult, but few natural passes existing. The low alluvial plain of the Atlantic seaboard of the United States is continued around the Mexican seaboard. Everywhere, as in the United States, the coast is lined with low islands, shoals, and lagoons. The western coast is also low, the broadest part being along the Gulf of California. On the western side there are no lagoons, and the harbors are numerous and good.

Outline.—The outline has no irregularities except the two remarkable peninsulas of Lower California and Yucatan; the former, almost unknown as to its capabilities, is the prolonged southerly extension of a coast range, sinking finally beneath the sea at *Cape St. Lucas*; the latter is a broad plateau-like spur of the continental axis, projecting northeasterly.

4. The Rivers are small and of a mountain character. **Lakes** are somewhat numerous, one of the principal being *Lake Tezcuco*, near the city of Mexico; it has no outlet and its waters are consequently salt.

5. Minerals.—Mexico is exceedingly rich in minerals of all kinds—gold, silver, copper, mercury, iron, tin, precious stones, marble, and others. The chief metal mined at present is silver; the largest mines, mainly owned by foreign companies, lie between the parallels of nineteen and twenty-three, though the north-western Pacific slope is thought to be almost covered with silver ore. Gold is mined chiefly in the north-west.

6. Coast Waters.—The *Gulf of Mexico* has a length of about 1,000 miles, and a breadth of 800; from Yucatan to Florida the distance is about 450 miles, the passages between each peninsula and Cuba being about 120 miles. Away from the immediate coasts, which are lined with islands, shoals, and lagoons,—the result of the deposition of sediment in the quieter shore-waters,—the Gulf is almost free from shoals, reefs, and islands. The waters are said to be deep in the Gulf proper, but careful surveys have not yet been made. The Equatorial Current enters between Yucatan and Cuba, and after sweeping around it, reproducing the phenomena of the Sargasso Sea in the centre, reunites with a current that had been deflected along the south of Cuba by the peninsula of Yucatan, and passes out into the Atlantic between the Bahamas and Florida as the *Gulf Stream*. The temperature of the Gulf waters is from six to nine degrees warmer than that of the ocean in the same latitude. The southern part of the Gulf is termed the *Bay of Campeachy*.

The *Gulf of California* is the water-filled valley between the plateau and a disappearing coast range; it is said to abound in fish of many kinds, including a species of oyster from which

pearls are obtained. Some of the bivalve shell-fish are very large. A curve in the south-west coast gives the *Gulf of Tehuantepec*.

7. Climate.—Mexico is mainly within the tropics, and so has phenomena of climate and production peculiar to tropical, but not equatorial, regions. Following the retreat of the sun southward the north-east trade winds, from October to May, bring cool weather and the dry, though not absolutely rainless, season; while the south-western return-trade winds, advancing with the returning sun, produce the so-called wet season, from May to October. The rainfall, however, is comparatively slight on the plateau, but on the low coasts it is heavy, especially on the eastern side, where the north-east trades from the Gulf are moisture-laden, and produce rain when they come in contact with the cooler land. The northern part of the plateau, beyond the tropic, has the same climatic features as the southern plateau of the United States. (See "North America," sections 13 and 14.)

The situation and physical conformation of Mexico give rise to a very varied climate:—the hot, moist, and unhealthy climate of the coasts east and west, where the thermometer in some places shows a mean annual temperature of 104°; the temperate climate of the lower parts of the plateau; and the cool, dry climate of the elevations above 6,000 feet.

8. Vegetation.—The vegetation, unsurpassed anywhere in variety and abundance, corresponds to the climates; in the low moist regions it is wholly tropical in kind, size, and luxuriance—tree-ferns, palms, mahogany, ebony, rosewood, tropical fruits of all kinds, and gum-producing trees—camphor, copal, rubber, &c.; in the temperate regions oak, cedar, and pine predominate; while the high colder regions have little forest growth, through insufficiency of moisture cactuses abound, as does also the mezquite, a tree resembling the honey-locust in leaf, fruit, spines, and wood, the roots of which almost equal anthracite coal as fuel. The cultivated plants are also typical of the regions; in the hot regions sugarcane, coffee, fruits, manioc, medicinal plants, rice, cotton, olives, cocoa palm, cacao—from which chocolate is made; in the temperate, European fruits and grains, indigo, vanilla, tobacco, capsicum or Spanish pepper—consumed in vast quantities—and the maguey, agave or pulque, from which the favorite drink of the Mexicans is made, and whose fibres are woven into cloth or twisted into ropes.



9. **Animals.**—Mexico belongs, for the most part, to the Neo-Tropical region and its animals are those of South America. Along with these and the cochineal insect, from which a bright scarlet dye is obtained, are found the ordinary animals of regions farther north—bisons, wolves, bears, &c. Domestic animals are abundant.

10. **Industries.**—*Mining* and *Agriculture* are the chief industries; both are rudely conducted. Irrigation is almost universal in agriculture. With few exceptions, agricultural products are all consumed at home. The rearing of cattle and sheep is carried on to some extent in the northern part of the country. The *Manufactures* are unimportant, commercially; distilled liquors, wine, sugar, cotton goods, earthenware, glass, and paper are made to some extent. The *Exports* consist of silver, gold, copper ore, hides, medicinal plants, cochineal, and the natural productions of the warm regions; in 1880 the value of the exports amounted to about \$33,000,000, silver alone forming nearly two-thirds of this sum. Fully two-thirds of the trade is with the United States. The *Imports* consist of textile goods, machinery, iron, dried fish, oil, &c.



FIG. 71.—GATHERING COCHINEAL.

11. **Inhabitants.**—In 1881 the population numbered a little over 10,000,000; of these over half were of pure aboriginal descent; those of European descent numbered only about 500,000, various mixed races forming the rest. Only in the north are there any savages. All races and classes are equal in the eyes of the law, and the highest offices have been held by pure blooded natives. The *Spanish language*—the language of the conquerors and colonizers,—is universally spoken. The people are generally of an unprogressive, indolent character. Railroads entering the United States have been constructed, or are in process of construction. The *Roman Catholic* form of worship is universal, and until lately was the only one allowed. *Education* is very backward, but some advancement has been made in recent years.

12. The **Government** resembles that of the United States—a federal republic; but its lack of stability has been a great misfortune to the country.

13. **Cities.**—Mexico has many large towns, five of them containing over 50,000 inhabitants each. The *City of Mexico*, with an estimated population of 250,000, is situated in the magnificent plain of Mexico, in the neighborhood of the great volcanoes; the temperature hardly ever exceeds 74°. The public buildings are numerous and fine—churches, banks, government buildings, libraries, charitable institutions, schools, theatres, &c. The business, even the leading retail trade, is in the hands of foreigners; the domestic trade is considerable. In the city, as everywhere throughout the country, are monuments of the civilization of the ancient people of Mexico. *Zacatecas*, *San Luis*, *Aguas Calientes*, and *Guanajuato* in the mining districts, and *Vera Cruz*, the chief sea-port on the Gulf of Mexico, are the other principal places.

CENTRAL AMERICA.

14. **Character.**—Central America is of but little importance politically or commercially. Very little is really known of the whole region. The continental axis

has here lost its plateau character, and the country for the most part consists of mountain ranges running in various directions, enclosing elevated valleys, some of which are almost plateaus in extent. The mean height of the land is not so great as in Mexico, though some peaks are nearly 14,000 feet high. The south-central part of Nicaragua is a comparatively low plain, while a remarkable transverse depression occurs near the southwest; elsewhere the country is mountainous. There are very many volcanoes in this region, and earthquakes are frequent.

15. The **Rivers** are merely mountain torrents. **Lake Nicaragua**, 100 miles long and 40 wide, and, in places, 240 feet deep, lies in the transverse depression, only 128 feet above the Pacific; on all sides the descent to it is steep. The San Juan river, containing several rapids, flows from it into the Caribbean Sea. It has been proposed to utilize this river and lake as a highway to the Pacific, several low-lying passes existing in the mountains between the lake and the ocean.

16. The **Coasts** on both sides in every respect resemble those of Mexico.

17. The varied **Climates** and climatic regions are like those of Mexico; they approach, however, to a greater uniformity in temperature on account of the inferior general elevation of the land, and to a greater degree of moisture with a more uniform distribution; the southern part is almost in the region of continual rain.

18. The **Productions** and *animals* are those of Mexico—of the Neo-Tropical region, without the northern types. The *Exports* are the natural productions of the forest, with medicinal plants and coffee.

19. The **Inhabitants**, as in Mexico, are mainly descendants of the aborigines; but the mixed races are numerous; the mixed Indian and negro race is rapidly dying out. The white inhabitants are chiefly settled on the western side. In the great forests that cover the eastern slope there are numerous savage tribes, hostile to each other and independent of the various governments. Everywhere, as in Mexico, exist monuments of former civilization; the overgrown ruins of more than one large city have been found in the densest forests.

20. The **Government**, except in Balize, is similar in all the states, being an imitation, or caricature, of that of the United States; but revolutions are of almost annual occurrence. Education is at a very low ebb.

21. The **Political Divisions** are *Guatemala*, *Belize* or *British Honduras*, *Honduras*, *San Salvador*, *Nicaragua*, and *Costa Rica*,

22. **Cities.**—In *Guatemala*, the most prosperous and advanced of the states, the chief city is *Guatemala*, a populous, active town; it has several schools, a public museum and library, and many handsome buildings—though built very low through fear of earthquakes. From its activity *Guatemala* is often called the Paris of Central America.

THE WEST INDIES.

23. **Extent.**—The West Indies comprise a curved chain of islands extending from the coast of Florida in the United States, to the Gulf of Venezuela in South America, thus shutting off that part of the Atlantic Ocean called the Caribbean Sea and the Gulf of Mexico. The whole area of the land surface is estimated at about 90,000 square miles.

24. **Geological Structure.**—Coral is everywhere found: it forms the foundation of the sand-covered islands, and either surrounds the shores of the others or exists as reefs and banks more or less distant from them. The Bahama Islands are wholly of coral rock covered with blown sand formed of small fragments of coral and shells. This sand, in many places blown into hills two or three hundred feet high, is often converted into limestone rock by the effect of rain-water.

All the larger islands—Cuba, Jamaica, Hayti, and Puerto Rico—and as far as Virgin Gorda, are chiefly of Palæozoic formation (including the Carboniferous,) with extensive developments of granite in the mountain chain that runs throughout them. This chain attains, in Cuba, the height of 8,000 feet.

The islands southward of this are in the main of volcanic origin; some of them contain extinct craters; two, Guadaloupe and St. Vincent, have active volcanoes. "The surface of these islands is very irregular and broken, mountains rising abruptly from 2,000 to 5,000 feet above the level of the sea. On the east side of the chain the rocks tower almost perpendicularly from the sea, affording no harbors; on the western coast the slope towards the sea is much more gentle."

The submarine character of these islands is peculiar. As far as is known the islands are only the most elevated portions of a submarine plateau of varying breadth and elevation. In the Bahamas the islands are, for the most part, along the eastern edge of this plateau. "Banks," or shoals, are exceedingly numerous, rendering the entrance from the Atlantic into the Gulf of Mexico very intricate and dangerous; the largest bank, the Grand Bahama, is 800 miles long and 80 broad. The larger islands occupy the greater part of the plateau, the shoals around them being in most places but a few miles in width. Among the southern islands the plateau is not so marked, the volcanic peaks apparently rising

from a great depth in the sea; coral reefs, however, are found often many miles from the shore. The whole character of these islands,—their trend parallel to the axis of the continent, and the existence of a submarine plateau,—proves that they are themselves merely a very low portion of the secondary or eastern axis of the continent.

25. **Climate.**—The climate of the West Indies is tropical, no snow ever occurring. In April the short wet season begins, lasting from two to six weeks, corresponding to our spring; then follows the short dry season or summer, in which the thermometer stands at about eighty, the heat being tempered by the regular land and sea breezes; the sky is particularly clear and the stars exceedingly brilliant. In July begins the long wet season, preceded by the failure of the land and sea breezes, and by a period of an almost suffocating atmosphere. This is the time of the hurricanes; thunder storms of fearful violence occur, especially in the afternoon, accompanied by deluges of rain. In the dry season, October to April, the atmosphere is delightful, the cool north-east trade winds blowing without intermission.

Earthquakes are frequent in the mountain islands, more especially in those of volcanic formation.

26. **Vegetation** is altogether tropical; the indigenous trees and the cultivated plants and fruits, including tamarinds, limes, arrow-root, and ginger, are the same as in tropical Mexico and Central America. Indian-corn is raised everywhere, but little or no wheat or other grain except rice.

27. **The Animal Life** is that of the Neo-Tropical region, but is remarkably poor in the higher orders, the mammalia; *birds* are numerous and of gaudy colors; *serpents* are found only in the palæozoic islands, but as a rule, are not venomous; *insects* are exceedingly troublesome; the centipede, scorpion, tarantula,—whose bite sometimes causes death,—and the jigger (chigoe), a species of ant that burrows in the flesh, are the most annoying; *fish* are abundant and in many varieties,—shell-fish being the most characteristic, from the huge conch to the tiniest shell as delicate in color as in structure. Other marine animals of lower types abound—sponges, sea-fans, sea-pens, sea-anemones, sea-cucumbers, and star-fish with many rays; turtles and land-crabs are also numerous.

28. The **Exports** consist mainly of the products of the sugar-cane (sugar, molasses, and rum), tobacco, fruit, and some coffee, with cabinet and dye woods from the large islands. The **Imports**, are breadstuffs, salted meats, textile fabrics, and hardware. There are no manufactures except cigars and lime juice.

29. **Subdivisions.**—The West Indies are grouped as follows: the *Bahamas*, extending from near Florida to latitude 20° south—all owned by Great Britain; the *Greater Antilles*—Cuba, Jamaica, Haiti, and Puerto Rico; the *Lesser Antilles*, most of which are owned by Great Britain, comprise the remainder. The latter are again divided into the *Leeward*—those between Puerto Rico and Martinique—and the *Windward*.*

30. The **British Islands.**—The *Bahamas* extend about 600 miles; their number is very great, but only about thirty have vegetation. Fruit, turtles, shell-fish, cabinet woods and salt are exported; the latter comes in large quantities from Turk's and Caicos islands, where it is made from sea-water by evaporation. *Andros*, the largest of the group, is the only one that has running water; elsewhere fresh water is obtained from wells whose contents rise and fall with the tide. Of the inhabitants, about 40,000, the black and mixed races far outnumber the whites. The government is representative,—a legislature elected by the people, but with all office-holders appointed by the crown. *Nassau*, the capital, on Providence island, has the only harbor in the group, the approach to the other islands being by boat.

31. **Jamaica** is about 151 miles long, with an area of 4,300 square miles. The Blue Mountains reach an elevation of over 7,000 feet; the surface is undulating where not broken by the mountains. The island is exceedingly beautiful and fertile, and the vegetation is luxuriant even to the mountain tops. The forest trees and the cultivated plants and fruits are the same as in tropical Mexico and Central America; only about two-fifths of the land is under cultivation. The exports are mainly sugar, molasses, and rum; but cocoa-nuts, coffee, pimento, and other productions are sent abroad to a limited extent. The island has many harbors. *Kingston* is the capital and chief town; of its population, (about 40,000) only one-eighth are white.

32. **Leeward Islands.**—These have all the same characteristics—lofty volcanic peaks surrounded by a low plain of coralline formation, fertile soil, luxuriant vegetation, and a healthy climate, with streams of water on nearly every island. All have exports similar to those of Jamaica, and all are thickly peopled. The islands form a federation on the representative principle, the chief officer being styled President. *Antigua*, the largest island, but streamless, is the seat of the federal government.

33. The **Windward Islands** are physically and politically similar to the Leeward Islands. *Barbadoes* (*bar-bā-d'z*) is the most important of the group. It is mainly coralline, and contains coral terraces a thousand feet high. Forest growth has disappeared. The area is 166 square miles, almost all of which is under cultivation. In 1876 nearly 38,000 hogsheads of sugar and 24,000 puncheons of molasses were exported. The population, nearly 180,000, is very dense, but only about one-eighth are white. *Bridgetown* is the chief city; it has a large distributing trade, for Barbadoes is rapidly becoming the commercial centre of the Windward Islands.

34. **Trinidad**—area, 1,755 square miles—is a continental island, neither coralline nor volcanic. It has mountains over 3,000 feet high. The climate is moist, for the island is

near the region of constant rains. The "pitch-lake" is well known; the pitch seems to have a slow boiling motion but is not hot; it is quarried and used as fuel. Water covers the lake in the wet season. The population of the island, about 150,000, is rapidly increasing. Trinidad is the most prosperous and active of the British West Indies. Coolies from China and India are largely employed on the plantations. *Port of Spain* is the capital. The government is that of a crown colony.

35. The **Bermudas**, 380 miles from Cape Hatteras, consist it is said, of 365 islands; only a few however are inhabited. These islands on account of being situated in the Gulf stream are wholly West Indian in character,—in their coral formation, their vegetable products, and the brilliant marine animal life of their clear waters; the forest growth, however, is poor, consisting of small cedar trees, but large enough to build light craft. Large quantities of early vegetables—potatoes, cabbage, onions, pease, &c., are sent in early spring to the markets of the United States. Fresh water is obtained from rain alone. These islands have many good harbors; they are the winter station of the British North American fleet, and contain a royal dockyard. *Hamilton* is the seat of government,—which is representative; this city is the winter resort for invalids from the continent. The population of the islands is about 14,000.

36. The **Spanish Islands.**—Cuba is by far the largest island of the West Indies; it is over 700 miles long, and varies from 30 to 130 miles in breadth; the area is 43,220 square miles. The coast, especially on the north, is very low, containing many salt lagoons,—the scene of salt manufacture,—and subject to floods in the wet season. This coast is unhealthy even in the dry season; the elevated interior is healthy at all times. Minerals exist, but only copper is mined; highly bituminous coal is met with and even mined in some places; natural oil wells abound, but are not utilized. Forest growth covers half the island. In 1877 the population numbered 1,425,000, half of these being whites, the remainder free blacks, Chinese coolies, and slaves; the latter are to be freed in 1890. Education is very backward. Of the cities, *Havana* (population about 240,000) is situated on a fine harbor, and has a very great trade in sugar, &c.; a railway connects the city with various places. Other important towns are *Matanzas*, *Cardenas*, *Santiago*, *Trinidad* and *Cienfuegos*. Cuba is represented in the Spanish Cortez (Parliament).

37. **Puerto Rico** the other island owned by Spain, is about 100 miles long and 40 broad. It is a beautiful island, and its cultivation of fruit for exportation is carried on much more extensively than elsewhere in the West Indies. It has several towns with a population ranging from 20,000 to 40,000 each; of these *San Juan* is the chief.

38. **French Islands.**—These are but six, chief of which are *Martinique* and *Guadeloupe*; they are fine islands, engaged wholly in the cultivation of sugar-cane.

39. **Danish Islands.**—Are all small, *St. Croix* and *St. Thomas* being the chief; the latter is an important station in the passenger and mail traffic with Europe.

40. **Dutch Islands.**—These are all under the coast of South America.

41. **Independent.**—Haiti or *St. Domingo*, 407 miles long and 160 broad, is in every physical feature a typical West India island; but commercially it is of the least value of all. The exports, almost wholly of forest products, are trifling and of inferior quality; sugar and cotton once largely exported are now not produced. The people are nearly all blacks or of mixed race, ignorant, lazy and almost barbarous; cannibalism is said to exist among them. Politically the island is divided into two republics, *Haiti* in the west and *San Domingo* in the east; the chief town in the former is Port-au-Prince, and in the latter *San Domingo*; blacks alone hold office, and in *San Domingo* can alone own property. Corrupt French is spoken in *Haiti*, and corrupt Spanish in *San Domingo*.

* The Spaniards apply the term *Windward* to all between Puerto Rico and the Gulf of Para, and *Leeward* to those along the coast of Venezuela.



SOUTH AMERICA.

1. **Extent.**—The greatest length of South America lies along the meridian of seventy, from 55° south to 12° north, and the greatest breadth along the parallel of five, south latitude, between the meridians of 35° and 81° west longitude. The area is estimated at about 7,000,000 square miles, being somewhat less than that of North America. In length and breadth the two continents are about the same. The southern continent lies much farther to the east, the whole of it being east of the meridian of Hamilton, Ontario.

2. **Outline.**—In outline South America is remarkably regular, not a single break occurs to effect materially the general shape produced by the relative directions of the continental axes.

3. **Structure.**—The great mass of the Andes, the main axis of the continent, has much less the nature of a plateau than the main axis of North America. Beginning with the southern extremity of Tierra del Fuego, the mountains, with a breadth varying from 20 to 40 miles, pass northward as a single range to central Chili where two ranges exist about sixty miles apart; in Bolivia the mountain mass, consisting of many ranges, reaches its greatest breadth—over 500 miles. From this point the Andes assume a peculiar character, the numerous ranges are either connected by cross ranges, or, starting from some huge mass, or “knot,” as a centre, radiate in many directions, often to reunite at another knot. These knots are especially numerous in Peru. The last occurs in southern Columbia; from this three ranges radiate, the eastern curves off to the north-east and east ending at the Gulf of Para, a branch running to the coast west of the Gulf of Maracaybo; the central range dies out in northern Columbia, while the western, the broadest and lowest, passes on through the Isthmus of Darien, where in places it is not more than 100 feet high.

The valleys enclosed by the ranges vary in width from twenty to sixty miles; they are usually low-lying, but, especially in the neighborhood of the cross ranges, they occasionally rise into high, broad plateau-like plains, such as the plateau of Bolivia.

The height of the valleys varies from 6,000 to 11,000 feet above sea-level; of the passes (of which the number is not great, except in Peru), from 10,000 to 15,000 feet; the highest peaks from 18,000 to 23,290,—the last being the height of *Aconcagua* in Chili. The height of the Andean mass is very great compared with the width, while the number of lofty peaks is especially remarkable. The greater part of these are active volcanoes, the most renowned being *Aconcagua* in Chili; *Sorata* and *Illimani* in Bolivia; *Arequipa* in Peru; *Chimborazo*, *Cotopaxi*—two of the most famous in the world—*Antisani* and *Rio-bamba* in Ecuador. Volcanoes are numerous throughout the entire length of the Andes. As the Andes are masses of mountains, the rise from the low lands on each side is quite rapid.

The eastern or secondary axis of the continent is decidedly plateau in character; its highest range is in the east, culminating in the Espinhaco mountains at the parallel of twenty. From these latter mountains a swell of land from 3,000 to 4,000 feet high, but containing some peaks much more elevated, runs in a zig-zag north-west direction fully 2,000 miles inland as far as the Madeira River, and forms the watershed north and south. From this swell many low ranges, generally parallel, extend to the north and to the south forming numerous valleys between them, till the whole, plateau and mountains, sinks into the surrounding plains.

In the north is another plateau; along its southern edge rise the Acaray and Parimé Mountains which send off low, short spurs northward. This plateau and the Brazilian plateau were doubtless islands ere the plains of the Orinoco, Amazon and La Plata were formed from the alluvium eroded by the rivers and sea from the adjoining highlands.

Elsewhere the land is low, not reaching a thousand feet in elevation. *One great plain* stretches from the mouth of the Orinoco to the southern extremity of Patagonia; there is no distinctly marked watershed between the basin of the Orinoco and that of the Amazon; the Cassiquiare River unites the upper waters of both basins, while only a very slight swell of land separates the basin of the Amazon from that of the La Plata. The great plain of the Amazon is nearly 2,000 miles long and 1,000 broad, and so low is this plain that where the Amazon enters Brazil 1,400 miles from the sea, it has an elevation of only 250 feet above sea level. Still more level is a portion of the *Plain of the Orinoco*, there being absolutely no difference of elevation; the *Plain of the La Plata*, over 1,000 miles long and in places fully 400 broad, is scarcely more sloping except where it rises towards the mountains. From southern Chili a narrow plain skirts the western base of the Andes northward, attaining near its starting place its maximum breadth of about 100 miles.

4. **Minerals.**—The mountains of South America have long been famous for their mineral wealth; every Andean state has the same metals, though not always to the same extent. *Gold, silver, quicksilver, copper, iron, lead* and *tin*, are universal, while *coal* is abundant in southern Chili and in Columbia; *emeralds*

also are found in the latter state. Silver is especially abundant; the mountain of Potosi in Peru is said to be composed wholly of ore. In the Brazilian plateau, besides gold and iron, *diamonds* are found, and in greater abundance than in any other country in the world. But except where the mines are owned or conducted by foreigners—in Brazil, Chili and Peru—mining is only rudely carried on; the absence of proper fuel for smelting is a great drawback to this industry.

5. The Isthmus of Darien, or Panama, connecting the two continents is thirty miles wide at its narrowest part. It is crossed by a railway which tranships large quantities of freight from one ocean to the other.

6. Capes.—The northern extremity of the continent is *Cape Gallinas*; the eastern, though not the extreme eastern, is *Cape St. Roque*; the southern, is *Cape Horn*, a bold rocky cape on an island south of Tierra del Fuego; *Cape Parina* in Peru is the western extremity. There is no peninsula in the continent.



FIG. 72.—ROUNDING CAPE HORN.

7. Islands.—The islands are small, unimportant, and few in number except where the Andes break up and disappear under the ocean in the south. The *Galapagos* off the west coast on the equator are a group of volcanic islands, best known for their fine turtles. The *Chincha* and other islands—small islets on the coast of Peru—are renowned for their deposits of guano, which is extensively used as a fertilizer especially in England. *Juan Fernandez*, off Chili, "Robinson Crusoe's Island," is a mere grazing farm at present. *Tierra del Fuego* is a large island with some scanty forests of dwarfed trees. The climate is very disagreeable, though the temperature never falls very low; fog, rain, snow and wind are almost constant; water-fowl are numerous. The inhabitants are among the lowest of the human family; they are thoroughly savage and kill all strangers coming to the island. They have no settled houses and go naked, or nearly so, even in the severest weather. Their

food is chiefly shell-fish and the flesh of the guanaco, both eaten raw. *Falkland Islands*, a somewhat elevated group belonging to Great Britain, are valuable as a place of refuge for vessels. The climate is very equable, but of low temperature and moist; there are no trees, but herbage is always plentiful. Domestic animals, fish and sea-birds are abundant.

8. The Coast Waters, owing to the lack of marked coast indentations, are for the most part unimportant. The *Strait of Magellan*; between Tierra del Fuego and the mainland, is over 300 miles long, has heavy tides, and many intricate passages; it is in consequence difficult for sailing vessels to navigate. The *Caribbean Sea* is said to be shallow for a body of water of such extent; it is free from reefs and shoals, except near the enclosing islands.

The southern division of the equatorial current sweeps the east and north-east coasts, but the eroding effect on the land is checked by the coast ranges on the east, and counterbalanced on the north-east by the enormous quantity of sediment brought down by the Amazon.

9. Lakes.—South America is devoid of lakes. The only lakes of considerable size are among the mountains, and for the most part are without connection with rivers; *Lake Titicaca*, the largest, lies within a basin of its own over 12,000 feet above sea-level; it has an outlet into another lake or rather a series of salt swamps. The islands in the lake and the surrounding regions, all contain numerous relics of the power and civilization of the ancient people of the land.

10. Rivers.—Like the northern continent, but to a much higher degree, South America possesses the conditions that give rise to great rivers,—vast tracts of country possessing abundant rain and sloping towards a common depression that has an inclination of its own toward far-distant oceanic waters. In extent of river basin along with abundance of rain South America, in its great Amazon River, stands unrivalled, while the La Plata, the Orinoco and many of the tributary streams of the Amazon itself, equal or even surpass in both length and volume most of the great rivers of the Old World; twelve of the tributaries of the Amazon are over 1,000 miles long. (See Part I., "Land Surface of the Earth," sections, 19, 20, 22).

The *Amazon*, under the name of the *Maranon*, has its extreme upper valley in sight of the Pacific, among the mountains of central Peru in about latitude ten, south. After a northerly course of over five hundred miles among the mountains, it turns and descends flowing in an almost direct easterly course to the Atlantic, the total length of the river being over 3,000 miles. Its width is proportionally great: it is a mile and a half wide 2,000 miles from the mouth, and the estuary is nearly 200 miles wide. The great depth, which often reaches three hundred feet, allows vessels of large size to sail up almost to the foot of the Andes, a distance of over 2,000 miles; no cataracts exist below the mountains. Though the fall

in the river-bed is so slight the current is said to flow at the rate of three miles an hour, and to be felt in the ocean at least 150 miles from land, the water at that distance being still fresh. The river forms no delta, for the sediment that must be brought down in vast quantities, is swept away by the ocean-currents.

The river is really a system of waters. "Its vast expanse, its system of back-channels joining the tributaries and linking a series of lagoons too many ever to be named; its network of navigable waters stretching over one-third of the continent; its oceanic fauna—porpoises and manatees, gulls and frigate-birds—remind the traveller of a great inland sea. The side channels through the forest, called by the Indians *igarapés*, or canoe-paths, often run to a great distance parallel to the river and intersecting its tributaries, so that one can go from Santarem 1,000 miles up the Amazon without entering it." In the period of high water, which varies in different parts of the basin, the Amazon overflows its banks inundating a wide extent of country. As yet there is little traffic on the river, but navigation is free to all nations.

The largest affluents from the north are the *Negro* and the *Yapura*, both similar in character to the Amazon, as are all the other tributaries from the plain; from the south, the *Madeira* and the *Tocantins*, the latter from the table-lands, having many interruptions to navigation.

The *Orinoco*, a deep broad river, has its basin confined to Venezuela; after a winding course of about 1,500 miles—the upper half containing many rapids and falls,—the Orinoco forms a delta a hundred miles long before entering the ocean. The head waters of the Orinoco are connected with those of the *Negro* by the *Cassiquiare*, a deep navigable river, the little plateau forming the watershed between the two basins being absolutely level.

The *La Plata*, or River Plate, is really the estuary formed by the union of the *Parana* and the *Uruguay*; it is about 200 miles in length and almost the same in breadth at the mouth. The water is charged with sediment which forms extensive shoals along the south shore. From the sea to the head of the *Paraguay* the distance is over 2,000 miles, the greater part being navigable for large vessels. Only a space of three miles separates the basin of this river from that of the Amazon.

The *Sao Francisco*, 1,200 miles long, though a highland river has but one fall from the beginning of navigable water to the mouth—over 1,000 miles. Like the southern tributaries of the Amazon this magnificent river forms a natural highway southward through a beautiful and fertile valley between two ranges of mountains. The *Magdalena* in the northwest, 900 miles long, is in a rough country and so is difficult of navigation; but it forms a much used means of access to the interior.

11. Climate.—South America has all the physical characteristics that insure an equable climate: an extreme climate such as that of the plains of North America is here an impossibility. Almost all the continent is within the region or the influence of a perpendicular sun, and the small portion that lies beyond is so narrow that its climate is insular. The mountain climate passes through all grades from the tropical to that of perpetual snow; nowhere does the variation in temperature from season to season exceed twenty degrees. The heat of the plain-country within the tropics is about 80°, seldom going beyond 90°.

On the mountains a tropical climate exists to an elevation of 1,000 or 5,000 feet;—in Ecuador sugar-cane grows at an elevation of 8,000 feet; between the elevations of 5,000 and 10,000 feet the temperature passes from the warmth of summer to the coolness of autumn. The region next above has for the most part a very low temperature, and like all mountain regions is exposed to sudden changes. The plateau of Bolivia and Peru is in this third region which is termed the *Puna*; in its higher portions it is wild and desolate with only a few Indians as inhabitants. The snow-line is reached at different heights, even in the same latitude; on the north side of Chimborazo in Ecuador at 15,914 feet, on Cotopaxi at 15,279, and lower yet on others.

The greater part of the continent is in the region of the trade-winds—north-east and south-east; the advance of these winds is not seriously checked till the Andes are reached. In consequence, the whole of this vast region, with some local exceptions, is well supplied with moisture; the north-east wind sweeps up the plain of the Amazon, giving abundant rain everywhere, but excessive in quantity at the foot of the Andes. In crossing these mountains the winds lose nearly all their moisture, and a desert from latitude 30° south to Cape Parina is the consequence both on the coast and mountain side. The north-west has abundant rain, for here the mountains are parallel to the trade winds; in the south-west, the "return-trades" from the north-west give abundant and even excessive rain on the west coast, but none on the east; the east is scantily supplied by occasional showers when the wind is from the east.

The rainy season follows the sun; in general this season begins in June and lasts till December, but there are variations; north of the Amazon and in eastern Peru, Ecuador and Columbia, rain may occur at any time. Along the desert coast of the west dense fogs or light rain are of almost daily occurrence between June and September; this phenomenon is probably caused by the influence of the polar current that sets north along the coast. South of the tropic there is an approach to our four seasons.

12. Vegetation.—South America also possesses in a marked degree the two essentials for the highest development of plant life,—heat and moisture. Nowhere else in the world does forest growth reach such gigantic proportions or extend over so vast an area, and nowhere else are found climbing and parasitic plants in so rich profusion or characterized by so great a delicacy and splendor of blossom. The foliage is most luxuriant, forming a thick canopy high in the air; the leaves are especially remarkable for their great length and breadth and the large proportion of them that are thick and fleshy.

Forest growth is found wherever there is rain, and in the *selvas* it is exceedingly dense; the base and sides of the moun-

tains are everywhere covered with forests except in the desert on the west, and even there the river valleys have magnificent timber. On the selvas of the Amazon dense undergrowth is not found except where there are openings along the rivers or elsewhere; the greatest luxuriance of undergrowth is met with in the valleys of the mountain slopes of the east coast;—here vegetable life runs riot.

The Llanos of the upper Orinoco are parched in the dry season and then both vegetable and animal life are torpid; after the wet season, when the flooded plains are again out of water, the Llanos are covered with magnificent grass and herbaceous plants; the Pampas of the Argentine Confederation, besides their scattered palm groves and their grass, have at different seasons vast stretches of weeds or of gigantic thistles.

The climatic conditions are the same throughout all the low-lying part of the valley of the Amazon, and hence a similarity in forest growth exists over all this vast region; the various kinds of tree found on the lower Amazon,—and no where else in the world are they so numerous.—are the kinds found on the upper Amazon, the Negro, and the Madeira. Indeed, the warm moisture-laden trade winds that sweep up the valley along the equator and, at the foot of the mountains, become even violent at times, carry tropical vegetation with them far up the mountains, clothing with forest-growth the whole of the range except the very highest peaks.

The forest trees include mahogany, dyewoods, india-rubber tree, palms of various kinds,—ivory, sago, wax, cocoanut,—myrtles, tree-ferns, the cow-tree—yielding a sweet, milky sap,—and the chinchona from which is obtained the "Peruvian bark," the source of quinine, the medicine so valuable in fevers. The home of this last tree is between the parallels of 5° north and 20° south, and at an elevation extending from 5,000 to 9,000 feet above sea-level. The cultivated plants include the yam, plantain, pine-apple, Indian-corn, cocoa, cassava—from which tapioca is made—the aloe and other medicinal plants, tobacco, coca, (a kind of narcotic universally used,) coffee, sugar-cane, rice, and, in the temperate regions, potatoes, peaches, grapes, and wheat.

13. Animals.—Abundance of animal life depends upon abundance of food; nowhere is food so abundant as in South America, and nowhere is animal life so teeming or so varied. But the types of life are

nearly all low, and when not low are for the most part the lowest of the kind; insect, reptile, and bird life exist in untold beauty, variety, and number; but the more highly organized forms, the mammalia, are inferior.

The European domestic animals, especially the cattle and horses introduced by the early colonists, have increased amazingly, and now wander in millions, more than half wild, over the llanos, pampas and campos of the continent from one end to the other.

The rivers abound in fish, often of great size; those of the Amazon are largely marine in character, and form nearly the whole of the food of the Indian tribes living along the banks of the river.

There are two marked zoological regions; the tropical, embracing all the tropical and forest country excepting the cooler parts of the Andes south of Cape Parina; and the extra-tropical, comprising the remainder of the continent. There are some animals such as the puma, jaguar, opossum, and humming-bird, that are common to both regions, but each region has its own peculiar types.



FIG. 73.—BRAZILIAN FOREST.

To the first belong a species of bear, the tapir, the peccari, the toothless sloth, ant-eater and armadillo, (the last covered with armor into which it can wholly withdraw), the water-hog, the monkey in endless variety including the prehensile-tailed monkey—the lowest of its class—the howling monkey, the slender-limbed spider monkey, and the beautiful marmoset; all the gaudy birds, the most beautiful of the humming-birds, (one not larger than a bee), the toucan with its huge bill, the uraponga or bell-bird, the parrot endless in variety, number and color, the low-typed wading birds, and numerous others, some with a fine song; the bat, one species measuring two feet across the outspread wings, and another, the leaf-nosed or vampire bat, that rubs up the skin of sleeping men and beasts and sucks the blood; the boa and all the most brilliantly colored snakes, some of which are poisonous; the turtle, alligator, and the lizard, including the iguana; the whole of the large and the gaudy insect tribe, with the destructive red ant, the tarantula-spider, scorpion, and huge mosquitoes that infest every part of this region.

Of the extra-tropical region the characteristic animals are the ostrich-like rhea of the pampas and Patagonia, the condor of the Andes, which soars to the height of 20,000 feet, and the penguin of the southern islands,—a sea-bird with undeveloped wings, which, when on land, sits erect on its webbed feet and short powerful legs; to the Andes belong also the domesticated llama and alpaca with the wild vicuna and guanaca, animals of the camel kind, all useful for their wool, that of the vicuna and the alpaca being the finest and most valuable. The llama is largely used as a beast of burden; it can carry a hundred pounds weight at the rate of twelve or fifteen miles a day. The beautiful little chinchilla, a burrowing rodent with exceedingly soft fur, is also a native of this region.

14. **Intercourse** is carried on in the plain-countries by means of the rivers, railroads being few; on the mountains, Indians, llamas, mules and donkeys are the ordinary means of conveyance for travellers and goods alike. Railroads constructed at great expense and in the face of extraordinary difficulty exist in all the mountain countries except Ecuador; railroads from Buenos Ayres to Valparaiso, and from Calao to the navigable water of the Amazon are in course of construction.

15. **The Inhabitants**, the number of whom is estimated at 28,000,000, consist of different classes: first, the *descendants of Europeans*, Spaniards, in all countries except Brazil, which was colonized by the Portuguese; they are the ruling class and the great land owners and planters, residing mainly in the cities; second, the *mixed races*, descendants of Europeans and natives; these constitute a large and important part of the population everywhere; third, the *native Indians*; of these the greater part who live in the Andes are more or less civilized; they have embraced Christianity, and form the laboring class, farmers, servants, &c., &c.; some are wealthy and own large estates; most of them cherish the memory of their greatness before the Spanish conquest; fourth, the *wild tribes* of the interior,—some of whom are very savage and are said to be cannibals—the *Patagonians* and *Fuegians*. In all the countries the population is sparse, in Brazil particularly so. Negro

slavery exists in Brazil alone, but will cease, according to a recent law, within a few years.

16. **Education** is much neglected except in Chili, Buenos Ayres, and Brazil.

17. **Industries**.—There are no manufactures of importance, agriculture, mining, and herding being the chief employments. The foreign trade consists in the export of the forest products, and of cotton, sugar, coffee, cocoa, copper, silver, and animal products—hides, bones and tallow,—and in the import of manufactures of all kinds, cotton goods predominating. Nearly all the trade is with Great Britain and the United States.

18. **The Government**, except that in Brazil, which is a limited monarchy, is Republican, modelled on the pattern of the United States. But Chili and the Argentine Republic are the only republics in which the government is settled, and these, with Brazil, are the only prosperous countries. In all the countries except Ecuador religious liberty is secured by law.

POLITICAL DIVISIONS.

19. **Brazil***, having an estimated area of 3,275,000 square miles, occupies all the central basin of the Amazon, and almost all the eastern highland region. Its natural advantages are exceedingly great; the highlands abound in minerals; the climate though warm is healthy; moisture nowhere is wanting; vegetation both natural

and cultivated is luxuriant; barrenness exists nowhere.

The Industries.—The resources of the country are almost wholly undeveloped. *Mining* for diamonds is extensively carried on; there are some gold mines, but they are worked by foreigners; iron is the only other metal sought to any important extent. *Agriculture* is the chief occupation; tropical plants and fruits—maté, or Paraguayan tea, plantain, manioc, bananas, &c., &c., are grown for home use, as well as some wheat in the south; coffee, sugar, and cotton are produced largely, and these with some india-rubber, cabinet and dye-woods, and hides, form the exports.

Of the **Cities**, *Rio de Janeiro* with a population of nearly 300,000 in 1872, is the capital and largest town; it has a fine

* For area, population, &c., see Appendix III.



FIG. 74.—CONDORS.

land-locked harbor. *Bahia* and *Pernambuco* are other large cities.

20. Guiana.—The low plain of the coast of Guiana is prolonged beneath the ocean for an unknown distance, and the old sea-beaches found far inland, and even at the foot of the plateau, show how the plain has originated. The plateau region is rough, but well wooded. Only the coast-plain is cultivated.

The only industry is *agriculture*, and the only plant cultivated for commercial purposes is the sugar-cane. Sugar, molasses, and rum, together with cocoa, and cabinet and dye-woods, form the articles of export.

Guiana is divided between the *British, Dutch and French*; the part owned by the British is the most important commercially; it contains the chief river, the *Essequibo*; on the islands in its estuary are the chief sugar plantations. *Georgetown* at the mouth of the *Demerara* is the chief city. *Paramaribo* is the chief place in Dutch Guiana, and *Cayenne* in French Guiana.

21. Venezuela, besides containing part of the northern plateau and the eastern chain of the Andes, contains all the valley of the *Orinoco*. The vegetation and animals are of the usual South America kinds. As in all the other countries of this continent, the resources of Venezuela are wholly undeveloped.

The exports are the products of the tropical forest, (india-rubber, *chinchona*,) together with coffee, cocoa, some cotton, medicinal plants,—such as *sarsaparilla* and *aloes*,—and animal products. Mining in connection with copper and gold is pursued to some extent.

Caracas is the principal city.

22. Columbia consists in the west of a mass of mountains, but in the east it forms a part of the great plain. The valleys among the mountains are hot, but every variety of climate exists in the more elevated regions.

The productions and exports in no way differ from those of Venezuela. Agriculture is rude, but the mining of gold, silver, emeralds and coal is vigorously carried on.

The country is a confederation of nine states with *Bogota*—a city elevated 9,000 feet above sea-level—as the general capital. *Colon*, or *Aspinwall*, and *Panama*, on the Isthmus, have important trade by rail.

23. Ecuador.—In surface characteristics Ecuador is similar to Columbia. The west coast is hot and unhealthy, with abundant moisture and a luxuriant vegetation; fruits are exceedingly plentiful. The lower ridges and valleys of the west are barren, but the higher valleys are productive; the valley or plain of *Quito*, 9,500 feet high, has a luxuriant vegetation but no forest growth, with a climate having no trace of winter.

There are many volcanoes around the plains of *Quito*, some of them the grandest in the world. All the towns lie at an elevation of from 8,500 to 9,500 feet above the sea.

Ecuador is the most backward of all the South American states; there are no railroads, but all travelling is carried on by pack mules, llamas, and Indians. It is not rich in minerals, but some gold is obtained from the river-beds. *Quito*, situated near the foot of the volcano of *Pichincha*, is the capital and largest city, but *Guayaquil* is the chief commercial centre.

24. Peru is one of the most active and enterprising countries of South America; its western coast-plain and western coast-ranges are altogether desert except where crossed by streams that originate among the peaks covered with perpetual snow. The river-valley in which *Lima* is situated is many miles wide and is extraordinarily productive; it is one field of cotton and sugar-cane. It is to these river-valleys, rather than to its silver mines, that Peru is indebted for the greater part of its wealth.

The country is exceedingly rich in silver, but though over 600 mines are said to be worked, very few of them are important. *Wool* of the llama, vicuña, alpaca and sheep—for large flocks of sheep are reared—are the other important commercial products of the highlands. In the lowlands, previous to 1878, *guano* from the islands and native *nitre* from a barren elevated plain in the south were exported in vast quantities; but in 1878 *Chili* seized the best guano islands and the best nitro fields. *Sugar* is the next most important export, followed by *chinchona bark*, *rice*, *cotton*, and the ordinary tropical products; *coca* is raised in enormous quantities.

The cities of the coast are *Lima* the capital, *Callao*, (population about 100,000) the port town of *Lima*, and the most important commercial city, and *Payta*, famed for its ships and sailors; all have houses only one story high and built with sun-dried brick,—for this coast has suffered from many severe earthquakes. *Cuzco*, the old capital of the Incas, and *Arequipa*, are the chief cities of the mountains, and have a beautiful climate. There are no cities in the eastern plain.

25. Bolivia, excepting that it now possesses no coast, in every respect resembles Peru in physical features, in minerals, and in vegetable and animal life.

It is however richer in *gold*, *silver* and *tin*. The gold is obtained as yet only from the alluvium of the rivers; the famous silver mountain of *Potosí* has had over 5,000 mines in it; the difficulty of procuring fuel for smelting has been a great hindrance here in mining.

Bolivia is less advanced politically and commercially than Peru; lack of sea-coast and means of communication have been injurious to progress; even yet there are but a few miles of railway in the country. Tropical growth in the eastern plains is exceedingly luxuriant, and what trade exists in products of this growth, is carried on by means of the affluents of the Amazon. The exports consist almost altogether of the product of the mines, including nitre.

The chief city and capital is *Sucre* (soo-crây).

26. Chili extends from latitude 18° south, to the extreme point of *Tierra del Fuego*, the eastern boundary being the main watershed of the Andes. Horizontally it has nearly all climates from the low temperature and wet and storms of the south, to the hot, absolutely rainless, and almost windless district of the north; even greater is the vertical range—from perpetual snow to

perpetual heat. In the south there is too much wet for wheat, but oats, potatoes, &c., do well; from lat. 52° to 37°, all the European grains and fruits grow finely; then follows the sub-tropical climate of Florida, with the characteristic productions, as far as Valparaiso, after which comes the desert.

Silver, nitre, and especially copper are exported in large quantities to Europe; while wheat and flour, agricultural products generally, timber and coal from the south, are sent to various parts of the western and south-eastern coasts. *Agriculture* is flourishing, for the western plain is in general highly fertile. Earthquakes are frequent, but are not so severe as those of Peru. Chili is the foremost of all the South American states in agriculture and manufactures, in education and intelligence. English, French and Germans are numerous, most of the commerce and industries are in their hands.

The chief cities are *Santiago*, the capital and largest city in South America; its port, *Valparaiso*, is also one of the largest cities.

27. The Argentine Confederation, consisting of fourteen states, is almost altogether a pastoral country;

the agricultural part is chiefly along the western side of the Parana in its southern course, and in north-eastern Patagonia; there is also some mining in the northwest. Vast herds of sheep and cattle feed on the pampas, and the products of these—wool, hides, bones, dried and salted beef—are the only exports; horses also are very numerous.



FIG 75 -GAUCHOS LASSOING CATTLE.

Indians occupy over half of the country—all the central part from south to north; many of the tribes are hostile to the whites, and carry on war with one another.

The number of foreign immigrants is very great, whole districts being settled by them; they are chiefly from Italy, Spain and Great Britain. The trade is largely with Great Britain and France.

The chief city is *Buenos Ayres*, the

capita! of the Confederation.

28. Uruguay and Paraguay have no distinctive physical features; in both agriculture is extremely rude; the chief trade consists in the products of vast herds of cattle and horses; *maté* or Paragnayan tea is also exported. Vegetation is everywhere luxuriant. *Montevideo*, an important commercial city, is the capital of Uruguay, and *Asuncion* of Paraguay.



THE OLD WORLD, OR EASTERN HEMISPHERE.

Introductory Remarks.—Physically the plan of the Eastern Hemisphere is characterized by a complexity wholly absent in the Western Hemisphere. The continents of the latter, with their simple structure, extend north and south and permit of the operation of simple climatic principles, with modifying circumstances, that affect vast areas; but the Eastern Hemisphere, along with a north and south extension almost as great as that in the New World, has its chief extension east and west. It is evident that this combination of extensions must make the operation of climatic principles much more complex. The complexity is increased still further by the existence within this hemisphere, and throughout its whole longitudinal extent, of vast, almost oceanic, bodies of water, having a temperature much higher than that of the open ocean, and divided and broken in upon by large masses of plateau-like land—Italy, Turkey and Greece, Asia Minor, Arabia, India, and Farther India. Added to this is the exceedingly irregular elevation of the main continental axis with its direction athwart the course of the prevailing winds.

In the great northern plain the climatic principles are as simple in their operation as in the northern plain of America; but the multiplicity of land-form elsewhere destroys all simplicity, and introduces what often appear as contradictions of those principles in climate and production. Were a lofty range of mountains to run from the Rocky Mountains to the Atlantic Ocean along the parallel of thirty-five, the climatic phenomena of southern Asia would be repeated in the southern United States; as it is, the open plain to the north of the Gulf

of Mexico is exposed in its southern part to polar winds,—an impossibility in southern Asia, and almost so in southern Europe, though lying farther to the north.

Of the widely-cultivated vegetable productions so useful to man, the Old World has produced nearly all,—only maize and the potato being native to the New World; all the domestic animals, except the merely local llama and vicuna of South America, also had their home in the Old World, where still dwell almost all the highest types of the higher animal life.

To the Old World, too, belongs all our modern civilization; for whatever may have been the civilization of Mexicans or Peruvians, it disappeared before the conquering Spaniard without leaving a trace of its influence upon the incoming civilization, or even of its existence except by architectural remains and in the writings of Spanish historians. Around all the southern waters of the Asia-Europe continent have existed different types of civilization that have more or less influenced others and profoundly affected vast numbers of the human race. The civilization of China, Hindostan, Persia, Asia Minor, Egypt, and Phœnicia, originated in unknown antiquity; that of Palestine, Greece, Rome, Arabia, and Western Europe, is altogether historical. The vigorous civilization of Western Europe, particularly that of the Anglo-Saxon type, is spreading far and wide over the world, not only in the colonies, but in the homes of the more ancient civilizations, in Italy, Greece, Palestine, Egypt, India, and China, thus repaying these countries for what it itself owes to them.

EUROPE.

1. **Extent.**—Continental Europe lies between the parallels of 36° and 71° north, and between the meridians of 9.5° west and 65° east; including the islands, the southern and the western extension are somewhat greater. On the south it is separated from Africa and Asia by the Mediterranean and the connected waters. The Caucasus Mountains, the Caspian Sea, and the Ural Mountains are natural boundaries on the south-east and east, but the Ural River, which is the remaining part of the eastern boundary usually assigned, is not a natural boundary, for it flows through a country everywhere identical in its physical characteristics. Indeed, there is no real natural boundary between Europe and Asia in this region; even the Urals are so low that there is as little difference between the countries east and west in climate and productions as there is in physical conformation;—Europe is but the westward extension of Asia in the form of a huge peninsula.

The area of the continent is 3,857,122 square miles, —somewhat larger than Canada.

2. **Structure.** (See Pt. I., page 8.)—The main axis of the continent,—the mountain chain on the southern side of the plateau,—is perhaps scarcely less continuous than that of America, even though the larger scale on which America is constructed be taken into consideration; but the secondary axis is much more broken and irregular. Neither axis, however, is at all equal in height or in massiveness to the axes of America.

The plateau itself is quite low, hardly ever exceeding 2,000 feet above the sea. In most places it is broken and irregular, particularly so in the Balkan region; it is intersected by numerous and low-lying river-valleys, and in one place sinks into a great plain, the plain of Hungary.

3. **Mountains**—The Alps, especially in Switzerland, with their culminating point, *Mont Blanc* 15,781 feet high, the highest peak in Europe, are the loftiest and most massive part of the main axis. Starting at the Gulf of Genoa they run northward under the name of *Maritime Alps*; then curving eastward and dividing, the southern range passes on under the names of *Pennine*, *Lepontine*, *Rhetian*, *Carnic*, and *Julian Alps*, to the valley of the Save River, while the northern range passes on under the names of *Bernese* and *Noric Alps*, to the neighborhood of Vienna. In the Alps numerous peaks are from 11,000 to 14,000 feet high; elsewhere in the main axis the peaks do not reach a greater elevation than 11,670 feet,—the height of the *Sierra Nevada* in Spain; but the great majority do not reach half that height. The *Pyrenees*, a broad mass of low mountains, have one peak over 11,000 feet high. The *Cevenne Mountains* in France rarely exceed 6,000 feet, while in the *Balkans* the height approaches 10,000 feet.

In the broken, irregular Secondary Axis the elevation is less; the peaks in the plateau-like *Jura* and its continuation the *Vosges* and *Black Forest*, the *Bohemian Forest*, the *Ore Mountains*, *Giant Mountains*, the *Harz* and other ranges, have an elevation of from 4,000 to 5,275 feet, very few being much over 4,500 feet high; the *Carpathians* are higher, one peak being over 9,500 feet. The spurs that part off southward from the main axis are in general low, but the *Apennines*, a range 800 miles long, to which Italy owes its existence, reach near Naples the height of 9,500 feet, and in Sicily the height of 10,875 feet, *Mt. Etna*. The other spur, the *Pindus*, a range that expands into the plateau of Greece, has no high peak except an outlier at the eastern end of a short cross range, *Mt. Olympus*, which is 9,750 feet high.

Of the mountains that cross the European plain, the *Urals* in many places are but hills, rarely over 2,000 feet high, the highest peak being 5,400. The approach to them is everywhere gradual, almost imperceptible; they have more the character of a plateau than of mountains. The *Scandinavian Mountains*, over 1,100 miles long, constitute a plateau for the most part, one portion being over 200 miles wide; some of the elevations are over 9,000 feet high. Everywhere in the higher valleys glaciers are found, while in the northern half of the peninsula they descend to the sea.

The region of Volcanic Phenomena lies south of the parallel of forty-two, including southern Spain and Portugal, southern Italy and the adjacent islands, and Greece and southern Turkey with the islands of the Archipelago. The only active volcano at present on the mainland is the well-known *Vesuvius* near Naples; it has been in almost continuous eruption for a century. In Sicily is the equally well-known *Etna*, a gigantic mass of volcanic matter; in the Lipari group is *Stromboli*, a low, barren island, the crater of which is always aglow; in the southern Archipelago is *Santorin*, a group of active volcanic islands, some of which have risen from the sea in the present century. Elsewhere the volcanic phenomena consist of hot springs, mud-volcanoes (in southern Sicily), and fissures in rocks from which issue carbonic acid gas, and sulphuretted hydrogen; these latter phenomena are seen especially in the Phlegrean Fields near Naples. *Earthquakes* are of constant occurrence throughout this region, southern Italy, Greece, and the Archipelago being specially afflicted. Within the last three years Spain, the islands of Ischia and Capri near Naples, and Kos and Khios in the Archipelago have suffered very severely.

4. **Minerals.**—Europe is not rich in the precious metals, but the most useful minerals are very abundant. The *coal* areas are chiefly in the British Islands, and in the region including Belgium and northern France, extending east into Germany and Austria; coal is found also in southern Russia. *Iron* is universal in the mountain regions; *Copper* is equally widespread. *Tin* is found in England, Saxony, and Bohemia; *Lead* is met with everywhere, but is richest in England, central Germany, and Spain; *Mercury* is almost confined to Spain and south-western Austria. *Silver* exists in many places, but central Germany and eastern Austria contain the richest mines; *Gold* exists in considerable quantity in the Carpathians and the Urals; the latter mountains are rich in all kinds of minerals. *Precious Stones* are found in many places, but the diamond only in the Urals. *Salt* (mineral) is largely developed in



England, Spain, Austria and elsewhere, while brine springs are met with over a large area. Many other minerals exist but they have merely a local development, or are met with only in small quantities.

5. **Plains.**—In the east the whole breadth of Europe is a plain. Narrowed by the Carpathian mountains, it skirts the northern side of the central plateau and terminates with the mountains of Norway and Great Britain, and with the Bay of Biscay,—the North Sea being but a slightly submerged part of the plain. The central plateau encloses another plain, the plain of Hungary. These plains are not flat, but are gently undulating; the only break in the great eastern plain is made by the Valdai Hills, the height of which, however, is only 1,100 feet.

6. **Outline.**—The outline of a continent depends upon the character and position of its axis. In Europe the mountain-spurs, or plateaus, that part off southward from the axis, in combination with the curving course of the axis itself, give rise to an irregularity much greater than is found in America, where there is but one solitary plateau-spur, Yucatan.

The north-western outline is much more regular than the southern, for a low narrow plain, locally indented indeed by the waves of the North Sea, fills up the roughness of the northern side of the axis. The gap between Denmark and Norway has little effect on the general outline, but the British Islands with their connecting isthmus sunk but a few fathoms below the surface of the water, form properly an important modifying feature of the whole western coast. The total length of coast line is nearly 20,000 miles.

7. **Peninsulas.**—All western Europe is one great peninsula with its broad isthmus lying between the Black and the Baltic Sea; in itself it is an aggregate of peninsulas, the continental axis terminating in the *Peninsula*. Politically all but the *Crimea* form either a single country or more than a single country: *Scandinavia* between the Atlantic and Baltic with its connected waters,—a compound peninsula, indeed, with its main isthmus between the Gulf of Finland and the White Sea; *Denmark, Spain and Portugal, Italy, Turkey and Greece*, and in effect, *Great Britain*, for only a very narrow and shallow neck of water lies between the chalk-cliffs on the opposing shores of France and England.

8. **The Capes** that are land-marks in navigation are *St. Vincent* in Portugal, *Finisterre* in Spain,—the extreme western point,—*Clear* in Ireland, *Land's End* in England, and *La Hogue* in France; *Matapan* in Greece, and *North* in Norway, are extreme points.

9. **Islands.**—The islands are exceedingly numerous and in many respects are highly important. Apart from the British Isles, the Atlantic islands are but the inequalities and foot-hills of the side of a mountain-chain that sinks beneath the sea; along the North Sea the islands are low, flat, and sandy like the coast; all were evidently once a part of the mainland; within historical times many have been washed away, and others have been separated from the coast. In the Mediterranean, the islands are large and important, and except where volcanic in origin, all consist of a narrow plateau or a low mountain-chain running parallel with the main axis of the continent, or with a near-lying spur; the islands of the Archipelago, other than volcanic, are the scattered termination of the eastern plateau-spur of the main axis.

10. **Coast Waters.**—No other continent at all equals Europe in the number and importance of its coast-waters. In addition to their decided effect upon the climate these seas are the scenes of great industries; they are the sources of supply of an important article of food; they not only extend far inland bringing remote regions in contact, but they send off arms on every side; great rivers flow into them so that those regions that are not reached by the sea itself, or by its arms, are reached by affluents of the sea; thus no other continent is so well supplied with natural means of internal communication. For untold ages these seas have been the highways of commerce, and civilization from the remotest times has had its home upon their shores.

The *Mediterranean*, 2,300 miles long with an area of nearly 1,000,000 square miles, is oceanic in character. A ridge crosses it from Sicily to Africa, 1,200 feet deep; east of this the bottom lies nearly 14,000 feet below the surface, and to the west nearly 10,000; the ridge at the entrance from the Atlantic leaves the water only 1,000 feet deep. The western shores, north and south, are comparatively regular, but the eastern are very broken. Shoals, the result of blown desert sand and Nile sediment, exist along the eastern half of the southern coast, but end abruptly at a few miles from the shore. The color of the water is a deep but bright blue, except in the east where it has a purplish tinge.

The evaporation is so great that not only is the water much saltier than that of the ocean, but it is increasing in saltiness, for the amount of water poured into the sea by the rivers falls short of the amount evaporated. In consequence there is a steady inset from the Atlantic and from the Black Sea. From the former the inset seems to be confined to the middle part of the strait, while at both sides and at the bottom the current is alternately in and out, following the tides. There is but little tide and that only in the west; fluctuations, however, are produced by winds. The temperature of the water is twenty degrees warmer than that of the Atlantic, only a thin surface-layer becoming cool in winter. The situation of the Mediterranean, between two very different climatic areas, exposes it to violent storms.

Marine vegetable life is poor, except near the shores, consequently marine animal life is also poor; very little exists at any

considerable distance from the shore. The tunny, sardine and anchovy are abundant, as are also shell fish. Fine sponges are obtained around Greece, and corals of different colors everywhere.

The *Adriatic*, 500 miles long and 100 broad, an arm of the Mediterranean, is rapidly filling up in its northern part—the Gulf of Venice; the delta of the Po advances 200 feet a year. The west shore is low, the east is high and lined with mountain-islands. Other parts of the Mediterranean have various names, the *Gulf of Lions*, *Gulf of Genoa*, *Gulf of Taranto*, the *Archipelago*, *Ionian Sea*, and the *Levant* at the eastern end.

The *Black Sea*, about 700 miles long and 400 wide, is much less salt than the Mediterranean; in the late fall the strong westerly winds raise the level of the eastern Mediterranean above that of the Black Sea, and then a current of salt water runs from the former sea into the latter through the connecting channels—the *Dardanelles*, *Sea of Marmora*, and the *Bosporus*; were it not for this current the Black Sea would be fresh. The water is over 10,000 feet deep in the centre, and varies greatly in temperature according to the season. Oceanic animals—seals, dolphins and porpoises, as well as mackerel, mullet, sole, and other fish are numerous. The shores west and north-west are low, elsewhere they are bold and rocky. Storms are frequent and violent. The connected *Sea of Azor*, is very fresh and shallow, extensive marshes lining its shores almost everywhere.

The *Bay of Biscay* is not deep; its heavy tides, strong currents and open character, make the navigation difficult and even dangerous. It has valuable sardine fisheries. The eastern part, where the plain dips under the water, is very shallow; the north-east shore is bold.

The *North Sea* is nearly 600 miles long and 360 broad, with an area of 1,400,000 square miles. The shore south and east is very low, protected only by low hills, or “dunes,” of blown sand and by artificial dykes; on the west are the chalk-cliffs of south-eastern England, and the rocks of the north-east end of Scotland. It is everywhere shallow, not over 600 feet deep except in “gullies”; there are very many “banks,” the chief of which is the *Dogger Bank*; here the water is only from fifty to a hundred feet deep. Storms are frequent and heavy, and fog often prevails. Marine vegetation is abundant, and the water is discoloured with “diatoms;” hence fish are extraordinarily plentiful—cod, haddock, herring, halibut, sole and others; it is one of the very best fishing grounds in the world. Fish to the value of over \$125,000,000 are taken annually.

The *Baltic*, 900 miles long and 200 wide, is rapidly filling up in the north; vast quantities of sediment accumulate at the river mouths and along the southern coast where fresh-water lakes, called “haffs,” are formed by it. The quantity of fresh water poured into this sea is very great; in consequence it is only brackish in the two northern arms, the *Gulfs of Bothnia* and *Finland*, and strong currents set outward through the connecting channels—the *Belts*, *Sound*, *Cattegat* and *Skager Rack*. Canals connect the head waters of its chief affluents with the rivers flowing into the Black and Caspian seas, and with the White Sea. Few fish are found in this sea.

The *White Sea* is shallow; it is open not more than five months in the year. Like all the northern oceanic waters it abounds in fish and other marine animals.

11. **Rivers.**—The general watershed of Europe, north and south, starts with the Cevennes and runs north-easterly to the Urals, passing through the southern Alps of Switzerland, the southern mountains of Bohemia and the Valdai Hills in Russia; thus it does not conform to the axis of the continent.

Few of the rivers of Europe in point of length or volume equal the characteristic rivers of America; but in extent of navigable water Europe is scarcely inferior to North America. In America the tendency of the streams is to unite in one great stream, in Europe the tendency is for them to keep separate. Thus in northern Europe a large number of important rivers, navigable for vessels of light draft almost to their source, run parallel to one another at comparatively small, but nearly regular, distances apart—the *Dwina*, *Nieman*, *Vistula*, *Oder*, *Elbe*, *Weser*, *Rhine*, *Seine*, and *Loire*. The same phenomenon is seen on the south-east in the much larger rivers,—the *Ural*, *Volga*, *Don*, *Dnieper*, *Dniester* and others. The rivers of Southern Europe, including Spain, flow from a plateau region directly into the sea, and in consequence are rapid for the most part and but little available for navigation; such are the rivers of Turkey and the Rhone. All the rivers of the north and east flow through plains, and are consequently sluggish in current and winding in course, the direct length being often doubled by the windings; this circumstance brings a far larger area in contact with navigable water. All have sand-bars which shift their position with any unusual inflow of water—a feature common to all rivers similarly situated. Most of the rivers of Europe, in part or in whole, are frozen over from three to six months during the year; almost all those of the western plain region are effected by the tides, and have broad estuaries—circumstances that materially add to their commercial importance.

The length of the rivers, except the great rivers of the basins of the Black and Caspian seas, is from 400 to 600 miles. The *Volga*, a stream starting in the Valdai Hills and emptying into the Caspian by very many mouths, has a length of about 2,500 miles; the *Don* and *Dnieper* each about 1,300 miles, the latter being a deep river at all seasons. The *Danube*, the next to the largest in Europe, with its headwaters in the Black Forest, is nearly 2,000 miles long; navigation for large boats begins at Ulm. It has very many affluents, a large number of which are navigable, the *Inn*, *Theiss* (Tice), *Drave*, and *Sava* being the most important. Owing to the rapidity of the current navigation west of the Carpathians is somewhat difficult even for steamers. Where the river pierces these mountains lie the “Iron Gates,” a shallow rapid, hurtful to navigation, but in process of being removed by the Austrian Government. The *Rhine* starts in Mt. St. Gothard in southern Switzerland, passing through Lake Constance where its muddy waters become blue and clear; from this lake to Mannheim its navigation is interrupted by several falls and rapids, but below that point it is unobstructed. In Holland it divides and subdivides, forming below with the *Maas* (Meuse) a huge delta. Its scenery in the plateau country is very fine, the picturesqueness being heightened by the existence of many fortifications and old castles along the hills. The trade of all kinds on this river is exceedingly great.

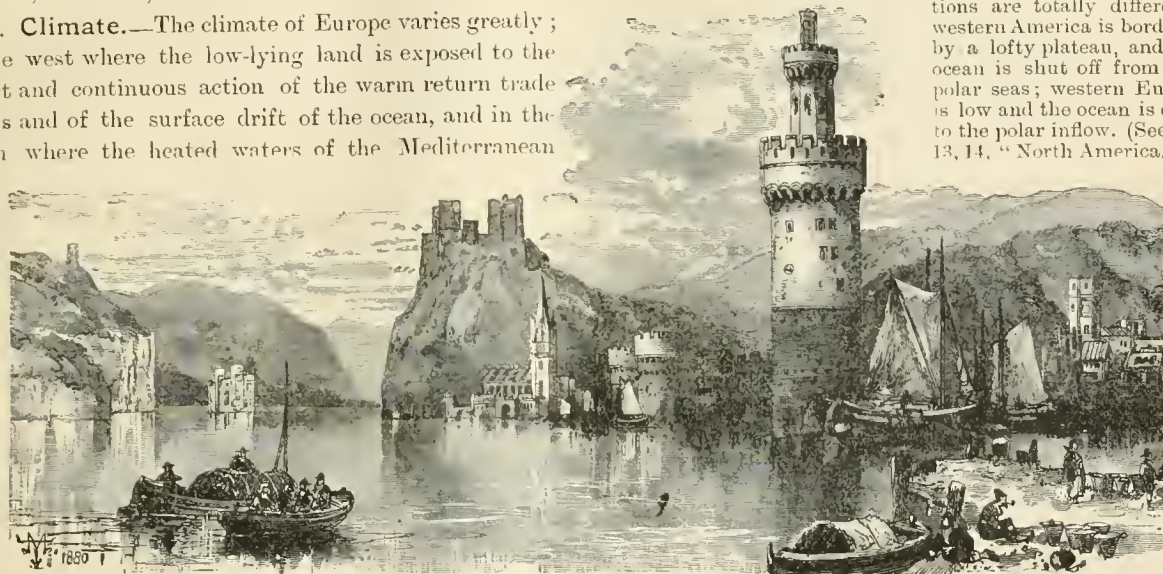
12. **Lakes.**—The lakes of Europe are almost all among the Alps or in the low lands around the Baltic Sea. Of the latter the largest are *Ladoga* with an area of over 6,000 square miles, and *Onega* in Russia, and *Wener* and *Wetter* in Sweden. Of the Alpine lakes, all exceedingly beautiful, *Geneva*, *Constance*, and *Neuchâtel* in Switzerland are the largest, but they do not exceed 200 square miles in area; their height above sea-level is about 1,200 feet; of the Alpine lakes in Italy the chief are *Maggiore* and *Como*, long, deep, and narrow, with beautiful scenery. (See page 7, "Sediment," and page 16, "Lakes.")

13. **Climate.**—The climate of Europe varies greatly; in the west where the low-lying land is exposed to the direct and continuous action of the warm return trade winds and of the surface drift of the ocean, and in the south where the heated waters of the Mediterranean

south-east to the mouth of the Danube and across the Black and Caspian seas; 20° follows down the Scandinavian Mountains from North Cape to south-central Sweden and then runs south-east, finally crossing the north of the Caspian; 10° takes a similar direction somewhat to the east, but crosses central Russia; 0° strikes the White Sea and runs parallel to 10°. The July isotherm of 80°, after following the southern and eastern shore of the Mediterranean, crosses south-eastern Turkey; 70° passes from north-western Spain through central France, north-east to the Urals in latitude 55°; 60° crosses the middle of the British Isles north-east to the White Sea; and 50° passes through Iceland to beyond North Cape, where it drops to the coast.

In comparing the climates of Europe and North America the comparison should be made between the western sides of the continents, for there the climatic conditions are the same as far as wind and ocean are concerned; but it must be remembered

that other physical conditions are totally different; western America is bordered by a lofty plateau, and the ocean is shut off from the polar seas; western Europe is low and the ocean is open to the polar inflow. (See sec. 13, 14, "North America.")



NO 76—VIEW ON THE RHINE.—TOWER AND RUINED CASTLES.

never cool and the influence of the perpetual furnace of the African desert is felt, the temperature is remarkably equable, showing an annual variation of only fifteen or twenty degrees; but away from such influences, to the north and east of the main axis, in the great eastern plain, the variations are nearly as marked as in North America; north-eastern Russia has a January temperature of -10° , and a July temperature of 50° . Naturally we look for the winter temperatures of Europe beyond the axis to increase in severity from west to east rather than from south to north, seeing that the centre of intense cold is within the great land-mass to the east, and the opposing warm winds are from the west.

The January isotherm of 40° drops from the north Atlantic south-east across Ireland, south-west England, central France, and then curves east through central Italy and southern Turkey; 32° after crossing Iceland north-easterly to near Norway, drops south to the mouth of the Elbe and thence curves

Moisture is abundant in Europe generally, but it is excessive everywhere in the extreme west; the only dry parts are the eastern plateau of Spain and the Kirghis steppes north of the Caspian.

14. **Vegetation.**—In character the vegetation of Europe, in both forest-growth and fruits and grains, does not differ from that of extra-tropical North America; the sub-tropical fruits of the south—figs, olives, lemons, oranges and almonds,—are replaced by mosses, lichens and stunted willows and birches in the extreme north. The common food-grains are cultivated even beyond the parallel of sixty, barley being grown in Iceland and almost to the northern extremity of Norway; the wheat region is in central Europe north of the main axis; the region of the vine and Indian corn stretches across the continent south of the parallel of forty-eight, including the southern plateau. *Forests* still exist on

all the mountains, in north-eastern Prussia, and Russia ; the latter country is said to be two-fifths forest.

15. **Animals.**—Except in the types characteristic of the extreme north—the reindeer and arctic fox,—animal life is remarkably uniform over Europe ; the wild boar, wolf, lynx, fox and bear are found wherever there are large forests and mountain fastnesses ; the wolf especially in the Carpathians and in the forests and steppes of Russia. Domestic animals are everywhere in large numbers ; even the camel is found in the south-east,—that Asiatic part of Europe. Birds are very numerous, especially in the moist, equable climates of western Europe ; the number and variety of singing birds are particularly remarkable ; the range of the nightingale extends north to the Baltic. Sea-birds, whose feathers and eggs are important articles of commerce, are innumerable on all the islands and coasts of the north-west. The serpents are harmless except the adder and spotted snake ; no large reptiles of any kind exist. Fish abound in the Atlantic—sardines and pilchard in the south-west, herring and cod in the north-west, and salmon in the rivers and estuaries ; of shell-fish, oysters are found in the waters of the north-west, but they are inferior to the American varieties ; lobsters and crabs are numerous in the same region.

16. **Industries.**—In Europe all the resources of nature are utilized to the very highest degree ; each industry employs the greatest skill and the profoundest science ; nowhere is agriculture, mining, fishing or manufacturing so thoroughly studied or carried to so high a degree of perfection.

Agriculture is the great industry everywhere, even in the densely peopled west ; *Mining* is a leading industry in all the plateau and mountain regions except Spain, Italy, and Turkey. *Fishing* employs hundreds of thousands of people in the maritime countries. *Manufacturing* of necessity accompanies the great facilities for distribution offered by the proximity to oceanic waters of so great an extent of country abounding in mineral wealth ; consequently the agricultural products of the sea-board countries do not suffice for the maintenance of the large populations of the innumerable cities to which manufacturing gives rise. *Navigation* here accompanies manufacturing ; manufactured products are transported to all corners of the world, and unwrought material is brought in from every quarter. The western nations are largely maritime.

17. The **Governments** vary from the republican of

France and Switzerland to the extreme despotic in Russia and Turkey.

Austria, France, Germany, Great Britain, Italy and Russia form the six *Great Powers* of Europe ; they exercise an important influence over the foreign relations of the minor states.

The existence of so many natural boundaries within the continent has been instrumental in the establishment of the great number of independent states that Europe contains. At the present day the tendency is toward a union of all who are of the same race under one government, except where natural obstacles are very great.

18. The **Inhabitants.**—(See pages 40, 41, section 12.) Of the Aryan or Indo-European family, there are several types represented in Europe, but except perhaps in Russia, there is very little pure blood. The *Germanic* race occupies all Germany, Norway, Sweden, Denmark, Holland, most of Belgium, Switzerland, Austria, England, and the Lowlands of Scotland ; the *Slavonic* race occupies all Russia, eastern Prussia (Poland), the countries of the lower Danube (including those to the east and south of Hungary proper) and Bohemia ; the *Greek* in Greece, and largely in Turkey ; the *Latin* in Italy, and part of Switzerland ; the *Celtic* in the Highlands of Scotland, in Wales, Ireland, France, and perhaps Spain and Portugal ; in the last three the people by mixture with the Latin races through extensive colonisation, are often regarded as of the Latin race. The Basques of the Pyrenees are thought to be connected with the Finns,—a *Mongoloid* race ; this race is found also in south-eastern Russia. *Jews* are numerous everywhere, but especially so in Russia and central Europe.

The total population of Europe in 1880 was nearly 325,000,000.

19. In **Religion**, Christianity prevails everywhere, except among Turks and Jews. The Germanic race is generally Protestant except in southern Germany and Austria ; the Latin race is generally Roman Catholic, as is also the Slavonic except the Russians ; so also are most of the Finns and Hungarians : the Lapps are in part heathen. (See page 41, sec. 13).

20. **Education** is liberally provided for by law among all the Germanic nations ; in the other nations, except France, education is much neglected.

21. **Political Divisions.**—These are Great Britain and Ireland, Sweden and Norway, Denmark, Netherlands, Belgium, France, Spain, Portugal, Italy, Germany, Switzerland, Austria and Hungary, Servia, Montenegro, Roumania, Turkey, Greece and Russia.



FIG. 77.—BRITISH HOUSES OF PARLIAMENT.

GREAT BRITAIN AND IRELAND.

1. **Structure.**—The sunken part of the European plain above which the British Islands rise, ends about a hundred and eighty miles west of Ireland, where occurs a rapid descent to oceanic depths. (Fig. 20.) The identity in character of the chalk cliffs, twenty-seven miles apart, on the opposite sides of the Strait of Dover, is one proof among many of the former connection of Great Britain with the continent.

Though differing materially in physical structure the two larger of the British Islands resemble each other in the general north-east and south-west direction of their mountains and elevated ridges, in the irregularity and ruggedness of the western coast where the hills sink beneath the sea and the Atlantic waves exert their full eroding power, and in the comparative regularity of the eastern coast, which in many places of both islands has a low, flat shore fringed with shoals formed in the quiet waters.

In number the British Islands exceed five thousand, the most being barren, uninhabitable rocks; the two largest are in

the east of the group, and thus have the others as barriers against the Atlantic. The total area is 120,832 square miles—England, 50,823; Wales, 7,363; Scotland, 29,820; Ireland, 32,531; Isle of Man, 220; Channel Islands, 75.

2. **Minerals.**—The Minerals are alike in the two islands—*coal*, *iron*, *lead*, *copper*, *salt*, some *silver*, and other metals, and *peat*; Ireland has no *tin*, and coal is far less abundant than in Great Britain, but the peat is in inexhaustible quantities. In the larger island nearly all the formations of the earth's crust (Fig. 2) exist, and somewhere come to the surface, bringing their minerals within the miner's reach—a circumstance of the greatest economical importance.

3. **Climate.**—Surrounded by water and exposed to the oceanic south-west winds and warm ocean currents, the British Islands have a very equable climate, the mean temperature in winter being about 40° , and in summer 60° ; naturally the west of each island is more equable than the east, while the north, though quite as equable as the south, is of a lower general temperature; in Shetland the mean summer temperature is 50° . The climate is everywhere moist, but it is especially so in the west of both islands, over a hundred inches of rain falling annually in the mountains of Wales and Cumberland. In some parts of eastern England, however, the rainfall hardly exceeds twenty inches. Snow, nowhere deep, is almost unknown in the south, especially in the Isle of Wight and the south-west.



4. **Vegetation** of both forest and field does not materially differ from that of Canada, but the moist climate gives and preserves a freshness unknown in America (see page 36, sec. 1, last paragraph). Wheat grows even in the Orkney Islands, but oats and barley are more suited to the hilly country of northern Scotland, while grass and crops other than grain are better adapted to the moist western districts of both Great Britain and Ireland.

5. **Industries.**—The great natural advantages of the British Islands, together with the energetic and thoroughly practical character of the people, have made the United Kingdom pre-eminent among the nations in almost every branch of human industry. The British Islands occupy the centre of the land surface of the globe; they lie in the highway between Europe and America; the equable climate obstructs labor but little. They are surrounded by seas that abound in fish and that penetrate far inland in all directions, furnishing unrivalled facilities for trade; iron and coal—those two all-important minerals in modern industry—lie side by side and in inexhaustible quantities, while nearly the whole surface consists of rich plains or grass-covered hills.

Mining.—Of the minerals mined coal and iron constitute over ninety-four per cent. of the value, which in 1881 was nearly £91,000,000; of coal 154,000,000 tons were raised, and of iron ore 17,500,000 tons; the value of salt was £1,150,000; of the tin £840,000; of the lead £729,000; of the copper £264,000.

Agriculture, with its connected industries stock-raising and dairy-farming, is most scientifically conducted nearly everywhere, but the food produced, though in very great quantities, falls far short of the needs of the dense population.

Fishing employs nearly all the coast population everywhere; in no other country is this industry so vastly developed. In 1877 nearly 250,000,000 of herrings were caught by Yarmouth boats.

Manufactures are of every kind, but *cotton, woollen, and metal goods*, and *crude iron* vastly exceed all others. In 1881 the value of the cotton goods exported (£79,000,000) greatly exceeded that of the total manufactured exports of France, the next most important manufacturing country.

Shipping.—Greatly as the United Kingdom surpasses all other nations in other industries, it surpasses them still more in shipping. In 1885 it owned almost half the vessels and half the tonnage in the world.

Trade.—The foreign trade is enormous. In 1883 the total value of the imports and exports was nearly £733,000,000, while the trade of France, the next chief commercial country, did not reach half that amount. The *Imports* are of all kinds, but the chief consist of raw material for manufacturing,—cotton, wool, timber, sugar, etc.—and all kinds of food,—breadstuffs, meat, tea, coffee, etc.; while the *Exports* consist of the manufactures and coal.

6. **Revenue, etc.**—The revenue is derived from import duties, mainly on tobacco, spirits, wine and tea;

from excise, income and land tax, the sale of stamps, licenses, the post office, and the telegraph.

7. **Army and Navy.**—Great Britain, though with a regular army of nearly 200,000 men, besides the Indian army of over 125,000, and volunteers and others, making a total of nearly 800,000, is not a military power; but as a naval power it surpasses all others in the world: “a British war-vessel is within a day’s sail of every place.”

8. **Routes.**—Means of internal communication are excellent; turnpike roads, the finest in the world, canals and railroads are exceedingly numerous; but the rivers, except those of England and the Shannon in Ireland, are not of commercial importance.

9. **The Government** is a limited constitutional monarchy, (see the History).

10. **Education** is well provided for; schools of a high class and colleges are numerous and good; the Universities of Oxford and Cambridge have long been celebrated, while excellent universities exist in Dublin, Glasgow, Edinburgh, Aberdeen, and elsewhere.

11. **Population.**—In 1881 the total population was 35,226,762; of England alone, 24,608,391; of Wales, 1,359,895; of Scotland, 3,735,573; of Ireland, 5,174,836; of the Isle of Man, 53,492; of the Channel Islands, 87,731. England and Wales contain 445 persons to a square mile, a density exceeded by that of Belgium alone. (See also “British Colonies,” Appendix III.)

12. **Religion.**—Perfect religious freedom exists; in England and Wales the Episcopal form of Church government is established by law; in Scotland the Presbyterian form; in Ireland there is no established church.

ENGLAND AND WALES.

13. **Physical Features.**—England and Wales, lying south of the River Tweed, the Cheviot Hills and the Solway Firth, form the most important member of the United Kingdom. Wales is a mass of low mountains that die away in the broken plain of Hereford in western England. Much of this mountain region consists of dreary, barren, thinly inhabited moorlands, broken by masses of crags of a wild and picturesque beauty. The *Snowdon* range in the north-west reaches the height of 3,570 feet. England is undulating, but the *Cumbrian Hills* in the north-west is an isolated group of low mountains whose long narrow valleys contain lakes, and of great beauty; it is the “Lake Country” of England. The *Pennine Range*, two hundred miles long, rises in *Cross Fell* to the height of nearly 3,000 feet; but it is mainly a series of rocky hills and of bleak, barren moorlands that

form a plateau over forty miles in breadth. The peninsula of *Cornwall* and *Devon* is mountainous in character, containing extensive tracts of moor, such as Dartmoor.

The *Uplands* are low, broad, rounded ranges, usually fertile and well cultivated. All start out from Wiltshire as a centre; one of limestone, including the *Cotswold Hills*, extends north-east, and ends in the higher moors of Yorkshire, forming the coast cliffs between the Humber and Tees; this ridge divides the agricultural country of the south-east from the mining and manufacturing country of the north-west. Another, composed of chalk, reaches the coast in the wolds of Norfolk; the *North Downs* run east to the Strait of Dover at South Foreland, while the *South Downs*, chalk like the North Downs, end at the Channel at Beachy Head. Elsewhere, including the western Lancashire coast, the country is a diversified plain.

In both England and Wales the highest land is near the west. The main watershed of England traverses the Pennines and the central plain, together with the Cotswold Hills; the river valleys, except the Severn, in consequence open out eastward and lie between the upland ridges.

14. **Capes.**—The seaward termination of the ranges give rise to the chief capes; on the east *Flamborough Head*, *North* and *South Foreland*; on the south, *Dungeness*, *Beachy Head*, and *Lizard Point*; in the west, *Land's End*, *St. David's Head*, *Holyhead*, and *St. Bee's Head*.

15. **Coast Waters.**—The *Wash* is very shallow and useless for navigation; several shoals exist at the mouth of the Thames, caused, as the *Wash* is caused, by river sediment. *Bristol Channel* has heavy tides, as also the *Solway Firth*; the *Irish Sea* and *St. George's Channel* lie between England and Ireland; in the south are *Southampton Water*, a fine inlet and harbor, and, north of the Isle of Wight, *Spithead* and the *Solent*.

16. **Islands.**—The east has no islands; on the south is the *Isle of Wight*, on the west are the *Scilly Islands*, dangerous rocks; *Anglesey*, a level, fertile island; *Isle of Man*, a low, mountain ridge, abounding in minerals. The *Channel Islands*, *Jersey*, *Guernsey*, and *Alderney* being the chief, are low islands near the French coast, with a seafaring population.

17. **Rivers.**—In consequence of the physical structure of the country, the chief rivers of England, with one exception, lie in the east. Though small, the extent of their navigable water is relatively very great; moreover, they all have broad and deep estuaries affording excellent harbors for the largest vessels; and as the course of most of them is through the great mining and manufacturing regions with the great centres of population, each has a great trading city near its mouth.

In the east, the *Tyne*, *Wear*, and *Tees*, the *Ouse* and the *Trent* (forming the great estuary called the *Humber*), and in the west the *Mersey* and its affluent the *Weaver* flow through the great mining and manufacturing regions, along with wide expanses

of rich agricultural country. The *Tyne* sends out more coal twice over than all France produces, and the *Mersey*, opening toward America, over half the goods manufactured in the Kingdom. The rivers entering the *Wash*, as also the *Dee* in the west, are useless for foreign trade owing to the silting up of the estuaries. The *Thames* and the *Severn* flow through agricultural regions; the former, 250 miles long, is the longest in England; its valley the richest, and its estuary the finest, open out towards that part of Europe where access to the interior is easiest and where are the most energetic industrial nations; hence the *Thames* has become relatively the most important river in the world. The *Severn* flows in a narrow valley bounded by hills, the channel being often gorge-like. The other rivers of England are comparatively unimportant.

18. **Cities.**—South of the dividing ridge (section 13), the cities and towns, excepting the sea-ports, are quiet agricultural towns, of very moderate size, few having any but local manufactures; hence this part of the country, excepting in the neighborhood of London, is less populous than that of the northern side of the dividing ridge, where the great industrial cities lie.

LONDON, situated on both sides of the Thames, and possessing every geographical advantage in addition to being the political capital of the Empire, has grown vast beyond all conception. In 1881 its population was nearly 4,800,000, and it increases over 80,000 annually. It is by far the largest, the richest and the greatest commercial city in the world. Vessels, warehouses and dock-yards line both sides of the river from the city to the sea.

Of the coast towns, *Newcastle* and *Sunderland* in the north-east are the centres of the coal, iron, and ship-building industries; *Hull* exports to the Continent the manufactures of the Humber basin; *Yarmouth* is the chief fishing town on the coast; on the south are *Brighton*, the famous watering place; *Portsmouth*, *Falmouth*, and *Plymouth*, stations for the fleet; *Southampton*, the point of departure for steamers to the Mediterranean and elsewhere; on the west are *Bristol* near the Severn, the great port for the Irish and West India trade, and *Liverpool* on the Mersey. This last city, with nearly 553,000 inhabitants in 1881, exceeded only by London and Glasgow, is second to London in commercial importance. It almost monopolizes the trade with America. Its docks are the finest in the world. Opposite it is the fine active town of *Birkenhead*.

North of the dividing ridge, throughout the whole of the moorland region of the southern Pennines and its neighborhood, are found most of the coal and iron of England, and here are the great manufacturing cities whose growth has been phenomenal. To the west is *Manchester*, the great cotton manufacturing city, with numerous smaller cities carrying on the same industry; *Macclesfield* is the seat of manufactures in silk. To the east in Yorkshire are the cities engaged in the woollen manufactures; *Leeds* the chief, then *Bradford*, *Halifax*, *Huddersfield* and many others, while *Sheffield* has the greatest cutlery factories in the world; near the south of the Pennines are the cities engaged largely in the production of iron and iron manufactures, *Birmingham* (428,000) and *Wolverhampton* being by far the greatest. Near by to the west are *Worcester*, famous for porcelain and gloves, *Kidderminster* for carpets, and *Stoke* and other cities of the "Potteries" for earthenware; *Nottingham* to the north is renowned for laces. *Oxford* and *Cambridge* are university cities. In Wales, *Cardiff* and *Swansea* are the seaports of the coal and iron district, while *Merthyr* is the chief manufacturing town.



SCOTLAND.

20. Structure.—Scotland, essentially mountainous, falls into two natural sub-divisions, the *Highlands* extending from the north to a line between the Firth of Clyde and Aberdeen, and the *Lowlands* between the former and England, including also the whole of the low eastern coast. The Highlands consist of numerous short ridges, often only vast stretches of barren moorland, which sink into low hills in the broken plain skirting the eastern coast. The highest general elevation is near the western side, where is also the highest peak in the United Kingdom, *Ben Nevis*, 4,406 feet high. "*Grampian Hills*" is a term vaguely applied to the south central Highlands.

The southern Lowlands are rugged in the south-west; elsewhere the hills often form tablelands, sometimes, as in *Broad Law*, with an absolutely level top. The chief ranges are the *Lowther*, *Lammermuir*, and *Cheviot Hills*.

Between the Lowland hills and the Highlands lies an undulating fertile plain, containing vast deposits of coal and iron that have made it one of the great centres of the world's industry.

21. The Islands, all of which are on the west or north, are of the same rugged, wild character as the neighboring mainland. The *Hebrides*, *Orkneys*, and *Shetland* are the chief.

22. Peninsulas and Capes, in consequence of the character of the shore, are very numerous; of the former *Cantyre*, stretching out to within thirteen miles of Ireland, is the most remarkable. Few of the capes and headlands are in the highway of commerce.

23. The Coast Waters in the east, where there are rivers and where the rock is softer, are of the nature of estuaries,—comparatively shallow and bordered by low flat land; in the south-west it is much the same, as with the *Firth of Clyde* for the most part; elsewhere they are ocean-filled mountain valleys. The *Little Minch* and the *Minch* are straits dividing the Hebrides from the mainland, while the *Pentland Firth*, remarkable for its roughness, lies between the Orkneys and the mainland.

24. Rivers.—The rivers are of a mountain or plateau character; the *Clyde*, in the west, flowing through the great coal and iron region, has been deepened artificially up to Glasgow. The *Forth*, *Tweed* and *Tay* are the other chief streams.

25. Lakes.—The mountain character of the country, with its short interrupted ridges and innumerable little valleys, gives rise to very many lakes or "lochs" often of great beauty, and contained for the most part in the wilder western half of the island.

26. Industries.—The industries are similar to those in similar districts of England and Wales, but the great extent of mountain land makes pasturage specially important. Two-thirds of the people are in the towns and villages.

27. Cities.—The towns, except *Inverness*, are all gathered in the Lowlands; the smaller have nearly all the manufactures of the larger. *Edinburgh* (236,000) is the political and intellectual head of the country. It is one of the finest cities in Europe.

Glasgow (674,000), by far the largest of the cities, has all the manufactures of all the large cities of England, including iron vessels. It has nearly all the foreign trade. *Dundee* and *Aberdeen* are large thriving cities. *Greenock* and *Leith* are active port towns. *Paisley* has large manufactures of thread.

IRELAND.

28. Structure.—Ireland consists of a central plain, comprising nearly half of the island, enclosed by an irregular ring of mountainous country, broken near the middle of the east and west. The most rugged regions are the north-west, the peninsula between Sligo and Galway Bays, and the extreme south-west; the last contains the *Macgillicuddy Reeks*, 3,400 feet high, the loftiest in Ireland. In the north-east the volcanic hills give rise to bold shores and the famous *Giant's Causeway*.

The northern half of the central plain contains very many extensive tracts of bog, separated by stretches of good agricultural land.

29. Minerals.—Though minerals, especially iron, exist to some extent, yet coal is found in but limited quantity, and is the only one mined. Peat, which is found almost everywhere, is the great source of fuel.

30. Coast Line.—As in Scotland, and for similar reasons, the north and the western outline are very irregular, rugged and wave worn, but with many fine harbors; the south, with fine harbors also, is much more regular than the west, while the east, comparatively low and regular, has no natural harbor except in the north-east.

31. Rivers.—The rivers, except the *Shannon*, are small and unfit for navigation. The *Shannon*, the longest river in the British Islands, is navigable for nearly its whole course; its lower basin is a fine agricultural and pasture region with a very mild climate.

32. Lakes.—The lakes or "loughs" are numerous; many are inlets of the sea, as *Swilly*, *Foyle* and *Belfast*; others are inland, such as *Neagh*, the largest in Ireland, and the lovely *Lakes of Killarney* at the base of the *Macgillicuddy Reeks*; still others are united in strings along rivers, such as the *Erne loughs* and those of the *Shannon*.

33. Coast Waters.—The inlets are naturally many: on the west are two great offshoots of the ocean like those of eastern Scotland, with *Donegal*, *Sligo* and *Galway Bays* at their head; farther south in sunken mountain valleys are *Dingle*, *Kennmare*, and *Bantry Bays*. Of the southern harbors that of *Cork* is the finest. *St. George's Channel*, the *Irish Sea*, and the *North Channel* (thirteen miles wide) divide Ireland from Great Britain.

34. Industries.—Ireland is almost wholly agricultural, but only one-ninth of the productive land is

occupied by grain crops, two-thirds is "permanent pasture." Linen in Ulster, and fine woollen fabrics in the large cities are the characteristic manufactures.

35. **Divisions.**—Ireland has four "Provinces,"—divisions coming down from ancient times,—*Ulster, Leinster, Connaught, and Munster.*

36. **Cities.**—As Ireland is agricultural, there are no large inland towns. *Dublin* (250,000), the capital and largest city, is situated at the eastern end of the plain, facing England the natural market of Ireland; hence most of the trade centres here.

Belfast (175,000) is the second city in size and the first in manufacturing industry; linen, cotton, and woollen goods are largely made. *Londonderry* is much smaller, but has the characteristic manufactures. *Limerick* on the Shannon is the centre of the great cattle and produce trade in the west with England. *Cork*, next to Belfast in size, and a station for the fleet, has the greater part of the trade with America. *Waterford's* sole trade, cattle and produce, is with Bristol. The other chief coast towns are *Morville* in the north; *Galway* in the west; *Queenstown* in the south; *Wexford* and *Kingstown* in the east. Of the interior towns the chief are *Enniskillen*, and *Armagh* in the north, *Kilkenny* (18,000), the largest inland town, in the south.

THE NETHERLANDS.

1. **Physical Features.**—The surface of the Netherlands is at sea-level near the middle of the country, and, in places, twenty feet below it at the sea-wall. This sea-wall consists of an almost continuous line of sand-dunes, often over a mile in breadth, the sand having been washed up by the sea itself and then blown into ridges by the winds. Where the dunes are broken, and along the lower course of the rivers, dikes have been erected to supply their place.

The *Zuider Zee*, a shallow body of water of but little use in navigation, was formed by the bursting of the dunes during a storm, and the long line of islands bordering the North Sea coast are the remnants of a former sea-wall. The area of the Netherlands is 12,648 square miles.

2. **Rivers, Canals.**—Owing to the universal flatness, the *Rhine* and the *Maas* (Meuse) interlace to a remarkable degree and form a delta, in which the waters of the *Scheldt* are also united. Canals, mainly for draining the sunken country, are sometimes so large as to be hardly distinguishable from rivers.

3. **The Climate**, owing to the lowness of the country and the almost continuous oceanic winds, is damp and unpleasant.

4. **Industries.**—*Agriculture*, including stock-raising, dairy-farming, market-gardening, and the growing of flower-bulbs employs by much the larger part of the

population. *Fishing* employs most of the coast population. *Manufactures* include vessels and their requirements, cotton, linen, and woollen goods, leather and liquors.

Trade, Shipping.—The Netherlands have extensive tropical possessions, with which a large trade in coffee, spices, etc., is carried on. The number of vessels owned is relatively large.

5. **The Inhabitants**, numbering 4,114,000 in 1881, are of the Low Dutch stock, close kinsmen to the English. The physical character of the country and the constant labor involved, together with the necessity of being continually on guard against powerful and unscrupulous neighbors, have made the Dutch industrious, thrifty, slow, phlegmatic, cautious, persevering, brave and liberty-loving.

6. **Education** is well provided for; there are several universities, that of Leyden being long celebrated. The Government is like that of Great Britain.

7. **Cities.**—In 1881 there were eight towns, with a population over 80,000 each. *The Hague*, the capital (123,500), contains the finest modern buildings, and is most modern in character; the others retain a very great deal of the old mediæval look. *Amsterdam* (328,000), built wholly on deep-driven piles, has connection by canal with the North Sea, and like *Rotterdam* (158,000) is intersected everywhere by canals. These two cities carry on nearly all the ocean trade.

BELGIUM.

1. **Physical Features.**—Southern Belgium, which borders the plateau, is a rough country, almost given up to forest, pasturage and mining; thence the land slopes north-west, finally sinking below sea level.

The area is 11,373 square miles.

2. **Minerals.**—The fine *coal fields* of the west and south are in the neighborhood of extensive deposits of *iron ore*; both minerals are largely mined.

3. **Rivers.**—The chief rivers, the *Meuse* and the *Scheldt*, both navigable for river-craft, originate in France.

4. **Climate.**—The coast has the damp, heavy climate of Holland, and the south-east the bright sky of an elevated inland country.

5. **Industries.**—*Agriculture* is not so general as in Holland; much food has to be imported. *Manufacturing*, in character and cause like that of England, is very extensive.

6. **Trade.**—The foreign trade is large, but the ocean-traffic is carried on almost wholly in British vessels.

7. **Education** is becoming generally diffused. Many high schools, and excellent universities and schools of art exist. The Government is similar to that of Great Britain.

8. **The Inhabitants** are of two races, the Flemings in the north and west are Low German, the Walloons in the south are Celtic, but French is the language of the educated class everywhere. The Belgians are much more lively and sociable than the Dutch. The population in 1884 was nearly 6,000,000, the densest in Europe.

9. **Cities.**—The manufactures give rise to many large cities: four, *Brussels*, *Antwerp*, *Ghent*, and *Liege*, have over 100,000 inhabitants each. *Brussels*, the capital (403,400), is by far the largest and most modern of the cities. Its distinguishing industries are the printing of books and the manufacture of lace. *Antwerp*, long “the queen of the Netherlands,” is still the great commercial city of Belgium; through it nearly all the foreign oceanic trade passes. *Ghent*, like *Antwerp*, was one of the great industrial cities of the Middle Ages. *Liege*, *Charleroi*, and *Namur* are the centres of the coal and iron industries.

FRANCE.

1. **Physical Features.**—From the water-parting in the line of the Cevennes and the Vosges, the whole country to the left slopes gradually north-west to the sea, but falling into three well-defined river-basins; to the right it sinks into the basin of the Rhone only to rise almost at once into a rough, hilly country that soon ends in the Alps.

Apart from the rugged interior and border mountain districts, France belongs to the European plain; rugged in Brittany, it sinks in the south-west into a perfectly flat region—the Landes, consisting of plains of ever-shifting sand, swamps, and heath, with few inhabitants and no towns.

2. **Mountains.**—The *Cevennes*, a mountain-mass containing many extinct volcanoes, start near the Pyrenees, attain their greatest height and massiveness in south central France, and die out to the west of the Jura. The *Vosges*, in the north-east, are merely a short range of low, rounded hills. The *Jura* range, in the east, is rather a plateau of limestone, deeply fissured and worn into fantastic shapes, with transverse gorges, often large enough for railroad routes, and even for towns.

The area of France is about 204,000 square miles.

3. **Minerals.**—The principal minerals are *iron*, which though wide-spread, is mined chiefly in the Cevennes and on the Belgian frontier, where nearly all the *coal* is found; *marble* and *lead* are largely procured in all the mountain regions; and *salt* in inexhaustible quantities among the Vosges Hills.

4. **Coast.**—France is very compact, the peninsula of Brittany alone breaking the general regularity. The coast waters proper are merely the river estuaries. Havre and St. Malo have the only good natural harbors; elsewhere there are merely roadsteads, artificially protected. The “Landes” are bordered by sand-dunes like those along the North Sea coast.

5. **The Islands** are unimportant, except *Corsica*, a mountainous island 100 miles long and 50 broad, with semi-tropical climate and productions.

6. **Rivers.**—The rivers are numerous, and, as they flow through a plain for the most part, are navigable for long distances; only in the estuaries can they admit large vessels. In the west, the *Loire* and the *Garonne* receive the melted snows of the Cevennes, and are apt to overflow their banks in the spring; the former, however, becomes almost dry in summer. The *Rhone* is a rapid

river, but the *Seine* and the *Somme*, of the north, are more sluggish.

7. **Climate.**—France has one of the finest climates in Europe; in the north it resembles that of southern England; in the south it is semi-tropical, but there are piercing cold winds in winter, and, under the Pyrenees, deep snow as well; in the west it is moist and mild, snow seldom falling; in the interior it is often very warm in summer, but only moderately cold in winter.

8. **Productions.**—Besides the ordinary fruits and grains, including maize, the *vine* is found everywhere, except in the north, while the mulberry, olive, fig, almond, etc., grow in the south.

9. **Industries.**—*Agriculture*, though less scientific than in Great Britain, supports over half the inhabitants; little grain or flour is imported. Silk culture belongs to the lower basin of the Rhone. *Mining* and *Fishing* are both carried on extensively; in *Manufactures* France comes next to Great Britain; in silks, hosiery, gloves, lace, perfumery, fine porcelain and glassware, France excels all other countries as it does also in wines and spirits.

Commerce is extensive, consisting mainly in the export of the articles manufactured, dairy produce and leather, and in the import of raw material, coal, coffee, tea, cattle, etc. The *shipping*, though important, is far inferior to that of Great Britain.

10. **Government, etc.**—France is a republic, with a president, a legislative assembly elected by universal suffrage, and a Senate chosen by various electoral bodies. *Education* is provided for by the government; France has some of the best universities in Europe, and Frenchmen have long held a foremost rank in all branches of learning, science and art. In *Religion* there is full freedom of worship. The *Inhabitants*, over 37,500,000 in 1881, are mainly Roman Catholics. Frenchmen have the reputation of being gay, pleasure-loving, fond of military glory, but industrious and frugal. France is a leading military power. The navy ranks next to that of Great Britain.

11. **Cities.**—As a manufacturing country, France has many large towns, nine have over 100,000 inhabitants each—Paris, Lyons, Marseilles, Bordeaux, Lille, Toulouse, St. Etienne, Nantes and Rouen. PARIS (population, 2,240,000 in 1881), in size next to London, the finest and gayest city in the world, is situated at the meeting point of the highways of France. Of its numerous manufactures, very few on a large scale, the typical ones are small articles and fancy goods of all kinds. Lyons is the great centre of the silk manufacture; Marseilles, on a fine harbor, has all the trade with the East, and extensive manufactures, chemicals and soap being the chief. Bordeaux is the centre of the trade in wine, spirits and dried fruits. Lille, in the coal district, is the seat of the linen manufacture. Toulouse is the chief city for trade with Spain; firearms, gunpowder, implements of steel and iron are largely manufactured. St. Etienne, in the southern coal and iron region, has characteristic manufactures. Nantes produces iron, lead and copper, and manufactures agricultural implements, oil, soap, etc. Rouen is the centre of the cotton manufacture—this industry being almost confined to the North.

Cherbourg, L'Orient, La Rochelle and Toulon are strongly fortified naval stations; Calais, Boulogne, Nice, Mentone and Monaco are watering-places; St. Malo is the chief fishing port; Brest has a large transatlantic traffic; Besancon has nearly all the trade in watches and clocks; these are made in every town and village throughout the Jura region.

SPAIN AND PORTUGAL.

1. **Physical Features.**—Spain and Portugal—the *Peninsula*—form a plateau from 2,000 to 4,500 feet in elevation, rising rapidly from the sea on the north and south, and more gradually elsewhere. The north-eastern face of the plateau, the main watershed, is a range of mountains to the west of the Ebro. From it two ranges, the bare granite *Guadarrama* and the *Toledo*, run south-west to the Atlantic; the *Morena* range forms the southern face of the plateau, and the *Cantabrian* and *Asturias* ranges, a continuation of the Pyrenees, skirt its northern edge. South of the Sierra Morena, and separated from it by the valley of the Guadalquivir, is the *Sierra Nevada*, the loftiest and most massive of the ranges, reaching the region of perpetual snow.

There is no low-lying plain except along the lower course of the Guadalquivir; but several plains of considerable extent are found on the plateau.

The area of Spain is nearly 200,000 square miles; of Portugal, over 36,500.

2. **Minerals** are abundant. *Coal* is found in the north and south-west; *lead* and *mercury* are somewhat extensively mined in Ciudad Real; *iron* is universal, but mined almost exclusively in the north; *salt* even forms ranges of hills.

3. **The Coast Line.**—The few irregularities are the terminations of the mountain ranges east and west. The shore is high, excepting narrow stretches between the ends of the ranges; the harbors are few, for most of the river mouths are silted up. The chief Capes are *Ortugal*, *Finisterre*, *St. Vincent* in the west; *Trafalgar*, *Tarifa* (the extreme south), *Europa* (near Gibraltar) in the south.

4. **Rivers.**—The chief rivers, *Minho*, *Douro*, *Tagus*, *Guadiana*, *Ebro* and *Guadalquivir* are, except the last, plateau rivers; either they flow through gorges, or are so rapid in their current as to be useless for commerce, some even partly dry up in summer; only the Tagus is navigable, even in its estuary. The Guadalquivir, fed by the streams from the snowy Nevada, though having a strong current, can be navigated by steamers for some distance above Seville. The little streams of the eastern and southern slopes are largely utilized for irrigation, some are even completely absorbed.

5. **Climate.**—The different exposures and elevations, with the numerous mountain ranges, produce very varied climates; the northern slope is like southern England; the eastern and southern slopes, shielded from cold winds but exposed in places to scorching winds from Africa, are tropical with very irregular rains, which sometimes come in torrents, sometimes are intermitted for months. The west is mild, equable, and very moist, two hundred inches of rain annually falling in places—an excess obtained at the expense of the interior plateau where only the mountains have sufficient rain, and where wide barren plains exist that need only water to make them fertile; the mid-basin of the Ebro also is barren. The plateau has a continental temperature; at

Madrid the range is from 7° in winter to 107° in summer. The valley of the Guadalquivir, sheltered north and south, has an exceedingly fine climate.

6. **The Vegetation** is characteristic of the climates; wheat, maize, grapes and the cork-oak are found everywhere; rye and apples in the north; almonds, oranges, lemons, figs, bananas and pomegranates, west, south and east; rice, cotton and sugar-cane in the south-east.



RICE AND RICE BIRDS.

7. **Industries.**—*Agriculture* generally, with vine-growing and cork gathering, is the chief industry; modern methods of cultivation are unknown, and both countries import breadstuffs. There is some *mining*, but in the hands of foreigners who export the ore, and some *fishing* in Portugal. *Manufacturing* is limited, and confined almost to the Spanish provinces of Catalonia and Valencia. The chief *exports* are ores, fruits, dried and otherwise, wine and cork; the *imports*, textile fabrics, articles of metal, dried fish and cotton.

8. **The Government** in both countries is like that of Great Britain. *Education* is very backward; a measure of religious freedom exists legally; the people are almost wholly Roman Catholic.

9. **The Inhabitants** differ in race and in character; in the north, including the Basques of the Pyrenees, they are industrious and trustworthy; in Catalonia and Valencia, they are gay, energetic, quick-tempered and even treacherous; these are the merchants and manufacturers of Spain; in the south, where there is much Moorish blood, they are witty, courteous, fond of display, energetic by fits, but constitutionally lazy; on the plateau, they are grave, dignified, and formal; bigoted, prejudiced, proud, boastful, ashamed to work, but not to beg. These last have been the rulers of Spain for centuries. The Portuguese are said to be like the Spaniards of the plateau, and untidy as well. In 1884 Spain had a population of 17,000,000; Portugal, about 5,000,000.

10. **Cities.**—In Spain five cities in 1877 had over 100,000 inhabitants each; nine others, over 50,000. MADRID (population 400,000), the capital, is in the midst of a wide, treeless, poorly cultivated plain, exposed to piercing winds and rapid, violent changes of temperature in summer. *Barcelona* (population 250,000) is the chief manufacturing and commercial city; it is gay, active and social, with many excellent educational institutions. *Valencia* (population 150,000) and *Malaga* (125,000) are the chief fruit and oil markets. *Seville* has cotton and tobacco factories with a large trade; this city and *Granada* are renowned for their Moorish antiquities, the latter containing the Alhambra, a Moorish palace famous for its architectural beauty. *Cadiz* exports the well-known sherry wine. *St. Sebastian*, *Santander* and *Oviedo*, in the north, are in the iron and coal region. *Ferrol*, in the north, and *Cartagena* in the south, are naval stations.

Portugal has but two large towns. LISBON (250,000), the capital, has a fine situation on the lofty banks of the Tagus, but it is not

a handsome city: its schools, colleges and public buildings are numerous and good. Its exports consist of native productions, including salt. *Oporto* (106,000), at the mouth of the Douro, is the great centre of the wine trade of Portugal.

11. **Islands.**—In the Mediterranean, Spain owns the *Belcaric* Islands (Majorca, Minorca, etc.), resembling the neighboring mainland in structure, climate, etc.; in the Atlantic, the *Canaries*, containing the extinct volcano *Teneriffe*, 12,182 feet high. Portugal owns the *Azores* and *Madeiras*. All these Atlantic islands are volcanic and lofty, tropical in climate and productions, populous, and all health resorts. Besides Cuba and Puerto Rico, Spain also owns several groups of islands in the East Indies. Portugal has large possessions in Africa, and some in Asia.

SWITZERLAND.

1. **Physical Features.**—In the south lies the Alpine mass; skirting the north is the Jura Plateau; between is a broken plateau that elsewhere would be called mountainous; only in the south-west and north-west is there a real, elevated plain. Between the Bernese and the southern Alps lies a deep depression across the whole country, forming the upper valley of the Rhone on the west, and of the Rhine on the east. From the pass of St. Gotthard, 6,700 feet high, the most elevated part of this depression, radiate in all directions many other valleys, each with its mountain torrent.

The varied and striking character of the higher summits, towering into the region of perpetual snow, the intervening lower peaks, the valleys, glaciers, torrents and dark forests, give to the Alps a grandeur and beauty not found elsewhere.

The Alps have very many peaks over 10,000 feet high. The Pennines contain the loftiest: *Mont Blanc* and *Monte Rosa* are over 15,000 feet; six others, the *Matterhorn* being the best known, are over 14,000 feet; other famous peaks are the *Jungfrau* (maiden) and the *Mönch* (monk). There are massive granite ridges, but the greater number of peaks are metamorphic, and their names indicate their appearance—"Silvered-needle," "White-horn," "White-tooth," etc. (See page 10, sec. 7, and Fig. 13.)

Many passes exist—low depressions between mountains approached by long, gradual rises—some of which are over 10,000 feet high. *Great St. Bernard*, *Simplon*, *St. Gotthard* and *Splügen* are the most famous passes. *Glaciers* are very numerous covering over 1,700 square miles, while the polished and scored sides of the valleys, and their boulder and rubbish-filled beds, show that more existed in past ages. The Bernese Oberland—the upland region below the lofty peaks—is especially famous for its glaciers. The *Mer de Glace* (sea of ice), near Mt. Blanc, and the *Zermatt* (Fig. 23) are the best known glaciers. The area of Switzerland is 15,992 square miles.

2. **Rivers and Lakes.**—The rivers, except the *Aar*, are mountain torrents fed by the glaciers, low in winter, full in summer. The lakes are very numerous and beautiful, *Geneva*, *Neuchâtel*, *Constance* and *Lucerne* are the chief.

3. **The Climate.**—In the Italian slope it resembles that of southern France; in the sheltered valleys and beneath the Juras the summer is long and warm, but with severe cold in winter; in the plain the climate is

not unlike that of Canada. The region of perpetual snow is from 8,000 to 10,000 feet above sea-level. though flowering plants have been found at an elevation of 12,000 feet.

4. **Vegetation.**—On the lower Italian slope are the fruits of southern France; in the sheltered places, even at some distance up the mountains, the vine flourishes; the ordinary grains grow nearly to the upward limit of trees. Deciduous trees—the oak, beech, etc.—extend to the height of over 5,000 feet above the sea; the coniferous trees—pine, etc.—as high up as 6,000 feet, after which, up to the snow line, comes a region of shrubs and grasses—the *Alp* pastures of the Swiss.

5. **Industries.**—*Agriculture*, but of necessity dairy-farming, is the chief industry. *Manufacturing*, owing to the fine water-power, stands next to agriculture; *watches*, *cotton* and *silk* goods, including embroidery, are very extensively made. There is but little mining. The exports are manufactures and produce; the imports are food, liquors, and raw material.

6. **Roads.**—Many fine carriage roads over the Alps exist; railroads are numerous for so rough a country: one crosses to Italy through a tunnel nine miles long, pierced through the solid rock of Mt. St. Gotthard.

7. **The Inhabitants** are of four races: Germanic, the greater part, all north of the Bernese Alps; French in the west and south-west; Italian in the south centre; *Romaunsch*, kindred to the Italian, in the south-east. Full freedom of religion exists. About three-fifths of the people are Protestants. *Education* is compulsory, and widely diffused. The total population is over 2,900,000. The *Government* is a federal republic of twenty-two cantons.

8. **Cities.**—In 1880 only five towns had a population of over 25,000 each: *Berne* (44,000) is the political capital; *Geneva* (69,000), "the white city," on Lake Geneva, is the centre of the watch and jewelry trade; *Basle* (62,000) and *Zürich* (76,000) are the chief seats of the silk manufacture.

ITALY.

1. **Physical Features.**—Italy, whether the peninsula or the plain of the Po, owes its existence to the Apennines. The peninsula is scarcely more than the central mountain-mass with the land falling away on each side from it, broadest (130 miles) where the mountains are broadest—for the Apennines are not a ridge but a long extended mass of mountains; and the plain of the Po is but sediment washed from Alps and Apennines and filling up what was once the head of the Adriatic, a sea that would not exist if the mountains were absent. The process is still going on, for sediment is still brought down, and the flat eastern shore of the plain is steadily

advancing eastward. In the peninsula parts of Campania and Tuscany alone can be called a low plain

The area of Italy is 114,410 square miles.

2. **Minerals** are lacking; but *sulphur*, in the volcanic districts, and fine *statuary marble*, at Carrara in northern Tuscany, are extensively mined. No coal exists.

3. **The Coast** is regular, except where broken by the mountain spurs at Gargano and near Naples, and by the rugged peninsula of Apulia; only near these is there any real bay or gulf. The Straits of *Messina*, *Bonafacio* and *Otranto* are the dividing waters.

4. **Islands**.—*Sicily*, *Sardinia* and *Corsica* are the physical counterparts of Italy; the *Lipari* and other small islands are volcanic and are mainly barren.

5. **Rivers**.—The *Po* is the one river. Sluggish in current and laden with sediment, the filling up of its bed necessitates embankments in many places, and gives rise to disastrous floods. The delta begins 25 miles from the sea. The chief affluents are the *Adda* and *Mincio*, with the *Adige* at the delta. The *Tiber* and *Arno* are navigable for a short distance, but their renown comes from the cities on their banks.

6. **The Climate**, owing to the influence of the seas, is equable approaching warm; rain is abundant. The *Po* valley, being away from the sea, has warmer summers and colder winters; snow lasts in the mountains, even as far south as Naples, from November till April.

7. **The Productions** are those of southern Spain; but beans, maize, chestnuts, and even acorns, form the chief, or sole, food of the peasantry in many places.

8. **Industries**.—In *agriculture*, the mulberry, olives,

grapes, oranges and lemons are the characteristic products; in *manufactures*, silks far exceed all others; wine, olive oil, articles of coral, and paper are also highly important; textile goods are largely made in the *Po* valley, Lombardy especially. The *trade* is extensive and increasing; coal, cotton and iron are the chief imports; silk is the great export.



FIG. 75.—BRANCH OF MULBERRY TREE, SILK-WORM, COCOON AND MOTI.

9. **The Inhabitants**.—The new national existence is fast destroying the old reputation of Italians for cunning, treachery and cruelty, features of character that existed along with high mental ability and appreciation of the fine arts—painting, sculpture and music. The great evil of Italy is the wilful idleness seen in every town and village. The *Government* is like that of Great Britain. *Education* is low, but is improving. Religious freedom exists. In 1881 the *population*, nearly all Roman Catholic, numbered 28,500,000.

10. **The Cities** are all interesting from their association with an ancient civilization and power. Nine have over 100,000 inhabitants—Naples, Milan, Rome, Turin, Palermo, Genoa, Florence, Venice and Bologna. *Rome* (273,270), the capital, is interesting above all other cities of Europe for its works of art, its ruins and its former greatness; its importance otherwise consists in its great influence as the ecclesiastical capital of 200,000,000 of people, rather than in its being the political capital of modern Italy. Its commerce is unimportant. *Naples* (463,200), the largest of the cities, has considerable foreign trade, and some manufactures in cotton and silk. *Milan* (296,000) is the great manufacturing city of Italy, as *Genoa* is the great commercial port—followed by *Venice*, the city of the lagoon islands, and *Leghorn*. *Florence* next to Rome is the most renowned for works of art. *Palermo*, in Sicily, is the fruit market of the south. *Turin* is the most modern of the cities, with manufactures in iron. *Ancona* and *Brindisi*, on the east, are seaports, the latter being the point of communication with the East.

DENMARK.

1. **Physical Features**.—Continental Denmark, or Jutland, is a spur of the European plain, ending in a cliff, the *Skaw*; 550 feet is the greatest elevation. The greater part of the west is a flat, barren plain, consisting either of shifting sand or of moorland bordered at the coast by sand-dunes. These are pierced in many places by "fjords," narrow arms of the sea that stretch far inland, or run for long distances behind the dunes.

The area is 14,124 square miles.

2. **The Islands** are of the same character as Jutland, except *Bornholm*, south of Sweden, which is rocky; it furnishes the only minerals of Denmark—fine marble, porcelain-clay and a little poor coal. The islands are very numerous, but the chief are Zealand, Funen and Lolland. These islands give rise to many channels, while the *Cattegat* and *Skager Rack* are almost seas in character.

3. **The Climate** is less pleasant than in Great Britain, and sudden but not extreme changes are common. The vegetation has no special features. The absence of coal, rapid streams, and native metals prevents manufactures; agriculture in its various forms is almost the only pursuit. The exports are agricultural, and the imports chiefly manufactures, coal, and iron.

4. **The Population**, over 2,000,000 in 1882, are nearly all Scandinavians; they are mainly Protestants of the Lutheran Church but religious equality prevails everywhere. *Education* is widespread. The people are intelligent, of a more lively disposition than the Germans, and take a keen interest in politics. The Government resembles that of Great Britain.

5. The only large **City** is COPENHAGEN (273,323), the capital, on the island of Zealand. It has excellent public educational institutions, and has long held a high place in literature. It has some manufactures; its porcelain is among the best in Europe.

6. **Possessions**.—In the West Indies, Denmark owns *St. John*, *St. Thomas* and *St. Croix*; *Greenland*, in N. America; in the North Atlantic the *Færoe Islands*—high rocky islands, yielding birds' eggs, and sheep. *Iceland* is a large volcanic plateau island, deeply indented by fjords fringed by low-lying land where alone soil is found. The cold is nowhere very intense; in the south the mean temperature in winter is 31°, in summer 56°; in the north, 24° and 42° respectively. The summer is everywhere short, only hardy vegetables can be grown; cattle, horses and sheep are numerous. Caring for these, gathering birds' eggs and down, and fishing, form the employments. The people, 72,500 in number, are settled all around the coast, or up the fjords and rivers. Sulphur and lignite exist in considerable quantity. Volcanic phenomena abound; of these the famous volcano *Hecla* and the *Great Geyser* are the most marked. *Reikjavik*, in the south-west, is the largest village.

GERMANY.*

1. **Physical Features.**—The coast district is low, with a ragged outline, fringed by sand-dunes, but not below sea level. Further inland, and crossing the whole country, is a broad, level tract of coarse, loose sand almost barren and but thinly inhabited, though Berlin lies in the midst of it; in the east it abounds in small lakes, in the west in extensive heaths that often contain large bogs.

Everywhere hilly, but with valleys and level tracts often of great fertility, the plateau region (in general south of the parallel of 52°) has few, if any, craggy or steep mountain peaks except in the Bavarian Alps in the south. The mountains are often cultivated far up their sides. Many little plateaus are supported by the main ranges and the numerous little cross-ranges. Bavaria and northern Württemberg are the least hilly districts.

The area of Germany is 212,028 square miles.

2. **Minerals.**—*Coal* is found chiefly in Rhenish Prussia, in Saxony, and Silesia; *Iron* is everywhere in the plateau, but is most abundant near the Rhine coal-fields and in the Harz Mountains—a wholly metalliferous ridge; *Lead* comes from the same districts; *Silver* is found with the lead and also in ore in the Harz, which likewise furnish most of the *Copper*; *Zinc* comes from the Rhineland and Silesia; *Salt* abounds as a mineral and as brine, the latter chiefly in the Bavarian Alps.

3. **The Coast Waters** are very shallow and dangerous; the "Haffs" along the Baltic have a narrow opening to the sea near one end of the enclosing bar or "nährung." The *Gulf of Danzig* is only a haff with its bar in part washed away.

4. **The Rivers** in the plateau, except the *Neckar*, *Main* and a few others, are unfit for navigation even for small boats. (See "Europe," sec. 11.)

5. **Climate.**—The climate varies little, the difference in height towards the south compensating for the more southern latitude. The plateau climate is as clear as the climate of Ontario, but milder and more equable.

6. **Industries.**—*Agriculture* in its various forms is the great industry. All the ordinary crops are raised, but rye is almost the only thing grown on the sandy region; the vine flourishes on the sunny banks of the Rhine, Neckar, and Moselle, and here the best wines are made. *Forestry* is a science in Germany; *mining* is extensively carried on in all the plateau. In *manufacturing*, especially of textile fabrics, machinery and implements of iron, Germany ranks high. Sugar (from beet-root) and spirituous and malt liquors are extensively made.

* For the names, etc., of the various States of Germany, Austria, and Russia, see Appendix III.

The trade is large, but is only about half that of the United Kingdom: live stock, chemicals, leather, and general manufactures are exported, and raw material, fish and tropical produce are imported. Foreign trade by sea is carried on through Hamburg and Lübeck.

The Inhabitants,—over 45,000,000 in 1881—are all Germans except the Poles in Silesia, and the French and Walloons in Elsass Lothringen (French, Alsace-Lorraine). The Germans are brave, plodding, almost phlegmatic, fond of tradition, speculative, and patriotic. *Education* is compulsory everywhere; schools and colleges are of a very high order, and the universities are numerous and renowned:—those of Heidelberg, Halle, Leipsig, Bonn, Berlin and Göttingen being most famous. Religious equality prevails; Bavaria, Baden, Elsass-Lothringen and Silesia are mainly Catholic, the other states Protestant.

Government.—Germany is a federal union of twenty-six states, including the three free towns,—Hamburg, Bremen and Lübeck. The King of Prussia is the head of the empire and bears the title of *Kaiser* (Emperor); the *Bundesrath* (Federal Council) is chosen by the governments of the various states; and the *Reichstag* (the Imperial Assembly) by the whole people. The army is the most powerful in Europe; the navy is neither large nor efficient.

7. **Cities.**—Few, if any, of the cities of Germany have originated in modern times; those, such as Berlin, whose political importance has increased, or whose physical surroundings suit them for the active, far-reaching, modern life—coal-fields, iron mines, water power, central position for internal traffic, or harbors for foreign traffic, etc.—have increased in size, and changed in character, while the others, deprived of their former importance, have remained stationary or even retrograded, as Brunswick, while still preserving their appearance in times gone by.

There were in Prussia in 1881 eleven cities of over 100,000 inhabitants each, and fourteen others of more than 50,000 each. **BERLIN** (population 1,316,100), the capital of the empire, and a centre of intellectual life, occupies a central position physically, though the country around it is poor. It is in many respects a handsome city, for the most part modern in appearance. Its industries are numerous, but the chief manufactures are in metal, of which machinery of all kinds is the principal. Of the sea-ports *Memel* is the great market for timber and hides; *Danzig* and *Lübeck* are the grain markets; *Bremen* has all the tobacco trade, and *Hamburg* (410,000) almost all the American trade. *Breslau* is in the coal and iron region of Silesia, as are *Elberfeld*, *Cologne* and *Essen* of the Rhineland; all have grown rapidly of late years, and all have extensive manufactures. *Königsberg*, *Magdeburg*, *Hanover*, *Düsseldorf*, *Stettin*, *Altona*, *Aachen*, *Frankfurt-on-the-Main*, are the other largest towns. In Saxony *Leipzig* excels all other German cities in the publishing of books. In Bavaria, *Munich* and *Nuremberg*; in Württemberg, *Stuttgart*; in Baden, *Mannheim*; in Elsass, *Strasbourg*; in Lothringen, *Metz*; in Hesse, *Mainz* (Mayence) are the chief remaining cities.

AUSTRIA-HUNGARY.

1. **Physical Features.**—Austria-Hungary is the most mountainous country of Europe next to Switzerland. The whole of the south-west is within the region of the main continental axis and possesses to the full all the characteristics of the Swiss Alps; the west is in the hilly



plateau; the north-east and south-east consist of the secondary axis with near-lying portions of the plateau. South of the parallel of 48° , as far as the Danube and Save, and between the meridians of 17° and 22° , the whole country, with a few breaks in the west, is a plain having an elevation above the sea ranging from 150 feet in the south-east to 500 in the west. Numerous little plains are found along the course of all the rivers outside of these bounds. The area of Austria is 115,903 square miles; of Hungary, 125,039.

2. **Minerals.**—Austria is very rich in minerals, which include gold, silver, mercury, coal, precious stones, as well as iron, copper, lead, tin, zinc, salt and others: *Coal* in all the northern plateau, but mainly in Bohemia; *Iron* nearly everywhere, but chiefly in Styria, Carinthia, and the northern plateau; *Lead* in Carinthia, but largely also in Bohemia and Hungary; *Mercury* at Idria in Carniola, next in importance to Almaden in Ciudad Real in Spain; *Tin* in Bohemia; *Zinc* near Cracow; *Salt* in vast quantities in Galicia; *Copper*, *Gold*, *Silver* and *Precious Stones* in Hungary.

Rivers.—The great central depression naturally brings toward it all the water from the surrounding highlands, Bohemia alone excepted. In this country the highest ground is in the south and the waters pass into the *Elbe* (or *Maldau*) which has cut a deep gorge for itself through the Giant Mountains. The *Danube*, though not in Austria at its source or its mouth, is the great river of the country; below Vienna it is a mile or more in breadth, often sluggish and forming long, wide marshes. The sudden change of course near Buda-Pesth, and again further south, is very remarkable. In its lower valley it is joined by the *Save* and *Drave* from the south, and the *Theiss* from the north—all three large, navigable rivers, and all three with wide marshes at places on their course. The *Oder*, *Vistula*, and the *Dniester* have their head-waters in Austria.

3. **Coast Line.**—Austria has an extensive coast line on the Adriatic; but it is precipitous and useless except on each side of the peninsula of Istria. The numerous islands are all of a mountain character.

4. **The Climate** is varied; the coasts of the Adriatic and the southern side of the Tyrolese Alps have the genial climate of Italy; the interior plateau and all within the southern slope of the secondary axis possess a more extreme climate, warm in summer and cold in winter, snow being frequent and heavy; while Galicia and, to a less extent, Bohemia have the climate of Ontario.

5. **Productions.**—Very little of the country is barren, except the mountain peaks and some tracts in southern Hungary. All the ordinary grains, food-plants and fruits, flax and hemp, are grown everywhere; maize and the vine, except in the north-east; olives, figs, oranges, etc., along the Adriatic and in southern Tyrol. *Forests* cover a great deal of the country but are most extensive in the east.

6. **Industries.**—*Agriculture* in all its forms, including stock-raising on the wide pastures both upland and plain, is the chief. *Mining* is extensively engaged in, and the production of the various leading minerals is very great. *Manufacturing* of native products and

of cotton is largely carried on in the west and north-west where the coal is found. The chief goods are cotton, woollen, silk, and linen fabrics; articles of the various metals; glass and porcelain in Bohemia; wine in Hungary; beer in the west; gold, silver, jewelry, fine cutlery in Bohemia and Vienna; leather and sugar in Bohemia and Moravia.

The trade is almost all overland; the leading exports are grain, woven fabrics, animals, fuel, sugar, and glass-ware. The imports are chiefly cotton, machinery, leather goods, and some food.

7. **The Inhabitants** are of various races; Germans in the west, with large numbers in Bohemia, Moravia and western Hungary; Slavs in the east and south and in Bohemia. The Slavs of the east and south are rude, with none but domestic manufactures. Magyars, a Turkish tribe, form the majority of the Hungarians; Italians occupy southern Tyrol; Jews are numerous in the north-east. *Education* is very backward except among the Germans. The great majority of the people are Roman Catholics, the Protestants forming a strong minority in Hungary; religious freedom prevails everywhere. The population in 1885 was nearly 39,000,000.

8. **The Government** resembles that of Germany. The two countries have a common sovereign, army, navy, and foreign relations, and a legislative body dealing with all common matters; but each has its own legislature for local concerns. Austria-Hungary is a strong military power; the navy is small but effective.

9. **Cities.**—In 1880 Austria contained five cities with over 100,000 inhabitants each, and nineteen others of over 30,000 each. VIENNA (1,104,000 in 1880), the capital, is in its newer part one of the handsomest cities in Europe; its museums, galleries, schools and colleges are excellent; its manufactures of silk, cutlery, musical instruments, and articles of gold and silver, and liquors are very extensive. Buda-Pesth (361,000), two cities on opposite sides of the Danube, the capital of Hungary, ranks next to Vienna in size and importance; in appearance it has an eastern tinge. Prague is the busy manufacturing city of Bohemia, Trieste on the Gulf of Trieste, does nearly half of the empire's trade by sea; it is the chief naval station. Gratz, the chief city of Styria, Brünn of Moravia, and Innsbrück of Tyrol, have large manufactures.

TURKEY, DANUBIAN STATES, GREECE.

1. **Physical Features.**—Excepting in the north-east this region belongs to the plateau. Highest in a line with the Balkan mountains, it falls off northward to the low Danube and Save valleys, and southward to the Ægean Sea. As elsewhere in the plateau, there are many parallel and cross ranges, and undulating valleys. In the rugged west the so-called *Dinaric Alps* are prolonged southward through the *Pindus* range into Greece. In the extreme east the *Balkans* divide into several low ranges, one extending to Constantinople. To the south the plateau breaks up, first into peninsulas, and then the multitudinous islands of the Ægean. Within the plateau only Thessaly in north-eastern Greece can be called a plain; Roumania and all northern Bulgaria belong to the great European plain.

2. **The Mineral resources** are almost unknown; the ordinary metals are said to exist quite abundantly; coal occurs in Bosnia, Servia, and Bulgaria, salt in Roumania; in Greece some silver, lead and marble are mined.

3. **The Coast** in the south, where the plateau breaks up and the mountain ranges protrude into the sea, is very irregular. The numerous peninsulas, of which the hand-like *Morca* is the most characteristic, enclose equally numerous bodies of water. The short western slope of the plateau ends, generally, in a bold coast often with towering precipices; the south-east and east are low, but not flat, while the north-east, formed of Danube sediment, is flat and marshy.

4. **The Islands**, excepting the few of volcanic formation, have all the physical characteristics, climate,—"eternal summer,"—productions, etc., of the mainland. The *Ionian* group,—Corfu, Zante, Cephalonia,—on the west, the *Cyclades* of the Archipelago and northern *Sporades*, belong to Greece; the rest, of which *Crete* (Candia), *Rhodes*, *Khio*, (Scio), *Mitylene* and *Lemno* are the largest, belong to Turkey.

5. **The Rivers** of the plateau and of Greece are commercially unimportant, excepting the *Maritza*. The *Danube* throws down so much sediment that its delta, a huge mass of marsh and lagoon, has advanced over ten miles within the Christian era, and artificial means are required to make the mouths safe for navigation.

6. **Climate**.—North of the Balkans and in the higher western plateau the climate tends to extremes; snow is heavy and the January temperature at the mouth of the Danube, 32° is that of Iceland in the same month; but the summers are hot. South of the Balkans and along the whole of the western coast the climate is Mediterranean, inclining to dry in the east but moist in the west.

7. **Productions**.—The grains and fruits are like those of Spain in similar situations, while vast forests of oak and beech occur everywhere.

8. **Industries**.—This region is one of great natural capabilities, but all industries languish. *Agriculture*, although rude, is the one general pursuit. From the Danube basin are exported large quantities of barley and wheat, animals, and animal products; from the other districts, figs, raisins, silk, olive-oil, etc., with currants from Greece. There is some *Fishing* for coral and sponges; some *Manufacturing* and *Mining* are done in Greece with some silk weaving in Turkey. The

imports everywhere are metal, articles of metal, and cotton goods. *Shipping* is an active and growing industry among the Greeks.

9. **Inhabitants**.—The inhabitants are very varied in race, and almost everywhere of very mingled blood. Bosnia, Servia, and Montenegro are mainly Slavonic; the Roumanians are descendants of old Italian colonists; the Bulgarians in Bulgaria, Roumania and Roumelia are Mongoloid, as are also the Turks; the Albanians, only semi-civilized, are of unascertained relationship, but, like the Montenegrins and other mountaineers, are daring and liberty-loving; in Greece the stock is mainly ancient Greek, but Albanians are numerous; there are many Greeks in Turkey also. *Education*, though not neglected, is in a very backward state, except in Greece.

10. **Political Divisions**.—Out of the fragments of the once powerful, but now dissolving, Turkish empire, many new states have already been formed.

BOSNIA belongs, except in name, to Austria. MONTE-NEGRO is independent with a patriarchal prince. The estimated area is 3,550 square miles and the population 250,000; the capital is *Cettinje* (2,000). SERVIA, also independent, has a constitutional king. The area is about 19,000 square miles, the population about 2,000,000; the capital is *Belgrade*, a city historically famous. ROUMANIA (Moldavia and Wallachia) also has a constitutional king. The area is about 45,500 square miles, the population over 5,000,000. The capital is *Bucharest*; other towns are *Jassy* and *Galatz*. Jews are very numerous, and with other foreigners carry on all the commerce. BELGARIA is tributary to Turkey, but has its own prince and legislature. The area



CONSTANTINOPLE.

is 24,400 square miles, the population 2,000,000. The capital is *Sofia*; other chief towns are *Rustchuck*, *Shumla*, and *Tarna*. EASTERN ROUMELIA, between the Balkans and the parallel of 42° , is in part self-governing; it has a Christian governor. *Philippopoli* is the capital. This country, with southern Bulgaria, is the country of roses, where the famous perfume, "attar of roses," is made.

TURKEY, (area 64,000 square miles, population about 5,000,000), is still a respectable military power, and its possessions in Asia are very extensive. The Turks are unprogressive; they make good soldiers, and the peasantry are industrious and hospitable; but vitality in politics and in industry does not exist. The government is a despotism; Mahometanism, of which the Sultan is the head, is the state religion. The capital is *Constantinople* (700,000), one of the famous European cities, advantageously situated upon the Bosphorus, with a good transfer trade but no manufactures, except some silk. *Adrianople*, *Gallipoli*, *Salonika* and *Janina* are the other chief cities.

GREECE (area 25,000 square miles, population about 2,000,000), repeats the continent on a smaller scale—a mass of peninsulas, every-

where open to arms of the sea. Its inhabitants are intellectual, inquisitive, eager for learning, cunning, money-loving, temperate, proud, and exceedingly democratic. Manufacturing is increasing rapidly. The government is like that of Great Britain. *Athens* (85,000), the capital and only important place, rises, like Rome, amid the monuments of a by-gone glory.

RUSSIA.

1. **Physical Features.**—Excepting the rugged regions of the border mountains, Russia is one undulating plain, reaching its highest elevation in the Valdai Hills, and sinking below sea-level in the “tundra” of the north, a vast marshy flat thawing only a few inches in summer. In the south-east are the “steppes”—elevated plains in places barren, but mostly with periodic herbaceous vegetation. So slight is the elevation of the watershed, that canals with scarcely a lock connect the head-waters of the Baltic rivers with those of other seas.

The area is 2,095,500 square miles.

2. **The Mineral** wealth of Russia is very great; the mining region is in the central Urals—gold, platinum, silver, copper, zinc, fine ornamental stone such as malachite, and precious stones, are all found, along with abundance of iron; the latter is also largely produced in Finland; as yet *Coal* is mined chiefly on the Don, and salt in the south-west. *Petroleum* in inexhaustible quantities is procured at Baku on the Caspian Sea.

3. **Rivers.**—The position of the water-parting, and the character of the country, give rise to large, sluggish and winding rivers. On the Arctic slope only the *North Dvina* is important; on that of the Baltic are the *South Dvina* and the *Neva* (between Lake Ladoga and the Gulf of Finland); in the south west the *Pruth*, the boundary. (See Europe, section 11.)

4. **Lakes** in the north-west of Russia, especially in Finland, are very numerous, *Ladoga* and *Onega* being the largest.

5. **Climate.**—Russia, a vast plain beyond the tropics, necessarily has an extreme climate,—not unlike that of inland Canada, though milder around the Baltic and the Black Seas than in corresponding latitudes in America. Rain is lacking in the south-east.

6. **Productions.**—Forests are found in all parts of the country; the whole of the north-east is one forest of pine, spruce and birch. The ordinary grains grow south of parallel 60°; to the north of that parallel, except in Finland, only a little barley is met with; “reindeer-moss” is the characteristic product of the tundra region. In the south semi-tropical fruits, etc., are common. In the central part are vast tracts of deep, black earth of inexhaustible fertility; this is the chief grain region.

7. **The Industries** are mainly *agricultural*; all kinds of grain, but rye especially, and other food plants are extensively raised; hemp and flax are widely cultivated also. Domestic animals, especially horses,

are extremely abundant. *Mining* is an important industry. *Manufacturing* is rapidly increasing; apart from textile goods, the characteristic manufactures are ornamental articles in gold, silver, and precious stones, and articles of fur. The exports consist almost altogether of grain, flour (going chiefly to Great Britain), animals, and timber; the imports, of textile goods, metals, coal and tropical produce. *Shipping*, through lack of sea-board, is limited; in the Caspian and White seas, *Fishing* is an important industry.

8. **The Inhabitants**, numbering over 87,000,000, are of different races, the Russians forming the great majority; Jews are numerous in the south-west. (See “Europe” section 18). In religion the Russians belong to the Greek Church, of which the Czar is the head; the Poles are largely Roman Catholics; the Baltic provinces are Protestant; the Lapps are semi-heathen, the nomad ones wholly so. Education is backward, but schools are numerous. The government is a despotism, the will of the Czar being law. The army is the largest in Europe, but the navy is much inferior to that of Britain or France. The Russians are docile, obedient to authority, industrious, sociable, not too tidy, ignorant and superstitious. The Finns are the most energetic and the best educated.

Finland has a government of its own, of which the Czar is the head but not the absolute master.

9. **Cities.**—Russia has many cities; ten of over 100,000 inhabitants each, twenty more of over 50,000, and sixty others of over 20,000. *St. Petersburg* (930,000), the capital, is built on low islands, most of the houses resting on piles. It is a very beautiful but unhealthy city; its industries are valuable, but its importance is chiefly political. *Moscow* (753,000), almost an eastern city in appearance, has important manufactures; *Warsaw* has a large trade in grain and cattle; the grain cities are *Riga* and *Odessa*; the mining, metal and gem-working cities are *Kazan*, *Perm* and *Ekaterinburg* (east of the Urals); *Kronstadt* in the north, and *Nicolaeff*, *Kherson*, and *Taganrog* in the south are stations of the fleet; *Archangel* exports timber; *Astrakhan* is the great Caspian port; *Baku*, on the desert shores of the Caspian, is the centre of the petroleum industry.

SCANDINAVIA (NORWAY AND SWEDEN).

1. **Physical Features.**—Scandinavia, as a peninsula, repeats Italy,—it is the creation of a mountain mass. This mass, of greatest breadth and height toward the south, has been ground down by the action of ice into a plateau, its slopes scored into deep narrow valleys by glaciers. Near and parallel to the western coast runs a rounded chain of mountains, called *Kiölen* (the keel) to the north of Drondheim where it forms the boundary between Norway and Sweden, and *Dorre Fjeld* to the south, its highest elevation being 8,400 feet. East of this range the slope is gradual toward the Baltic and connected waters, where it ends in a low sandy shore, except in the extreme south; the western slope, which is highest and narrowest, ends often in abrupt shoulders or sheer precipices of giddy height. Only here and there in Norway is there a patch of low coast,—which is always



rugged ; but the whole plateau is cut by deep narrow clëfts which within the plateau form lakes or valleys, and on the coast “fiords” or firths, some, as the fiords of *Sogne* and *Hardranger*, penetrating a hundred miles inland with sides that tower in perpendicular cliffs from the water’s edge.

The area of Sweden is 171,000 square miles ; of Norway, 123,000.

2. **Minerals** are comparatively lacking in Norway, but Sweden furnishes in abundance the best *Iron* in the world, which is used largely for steel making ; its *Copper* is almost equally abundant and is as extensively mined.

3. **The Coast** of Norway in its entire length is lined with islands between which and the shore lie navigable channels fully protected from the waves of the ocean ; inside the fiords thus protected harbors are numberless and safe. The *Lofoden*, a group of large islands in the north-west, are almost as high, rugged and rocky as the mainland, while *Oland* and *Gothland* of the Baltic are like the coast of Sweden, low and fertile.

4. **The Rivers** are all mountain streams, unnavigable except where at the coast they fall into fiords ; the *Lakes*, as numerous as the rivers, are the long, narrow, deep mountain lakes, except *Wener*, *Wetter* and *Malar* of southern Sweden.

5. **Climate**.—The warm oceanic waters and winds give a mild, equable, but moist climate to the west ; the extreme north has a higher temperature (32°) in winter than has the shore of the Skager Rack ; Sweden on the other hand from its position has an extreme climate, hot in summer, cold in winter.

The snow line is never higher than 5,000 feet ; fields of perpetual snow sending off glaciers on both slopes, exist in many places ; the largest are near *Sogne* and *Hardranger* fiords ; only in one place, in the north-west, does a glacier reach the sea.

6. **Productions**.—Forests of fir, beech and birch abound ; wheat and apples grow well only in the south, but oats, barley and potatoes grow even in the extreme north ; for here the length of continuous sun-light is seven weeks, and the crops are sown and gathered within that time.

7. **Industries**.—*Lumbering* and *Fishing* in Norway, *Mining*, *Lumbering* and *Agriculture* in Sweden, are the great industries ; *Manufacturing*, except of lumber and pig-iron, is but little pursued. In *Shipping*, Norway relatively exceeds all other nations. The exports of the products of the forest and of the fisheries are very extensive, and Swedish iron finds a ready market in England. Herring and codfish swarm on the coast, especially around the *Lofoden* Islands ; shell fish abound, and sharks and whales of several kinds, all valuable for their oil, are captured in large numbers.

8. **The Inhabitants**.—in Sweden, 4,650,000 (1854), in Norway, 1,800,000 (1875),—are mostly of the German stock, and speak mutually intelligible dialects. Besides the Scandinavians there are a good many Finns and Lapps, both Mongoloid races ; the latter partly nomadic and only partly christianized, live in the north and subsist on their reindeer, fishing and hunting ; the Finns mingle with the Germanic races, and all are industrious, frank, hospitable, and brave, and make some of the best sailors in the world. *Education* is widespread, schools are numerous and good ; the university of Upsala has a wide reputation. Nearly the whole of the population belong to the Lutheran Protestant church. The *Government* of each country resembles that of Great Britain, the bond of union being a common sovereign. The two countries have each their own army and navy.

9. **Cities**.—As a consequence of the character of the industries the population is not gathered into cities. In Norway, *CHRISTIANIA* (76,000), the capital, *Bergen* and *Trondheim* are the chief towns ; *Hammerfest*, the most northern place of residence, is a village of wooden houses. In Sweden, only two towns have over 50,000 inhabitants,—*STOCKHOLM* (205,000), the capital, and *Göteborg* ; *Malinö*, *Karlskrona* and *Upsala* are important places.

ASIA.

Apart from the territory under British control, Asia is comparatively little known to Europeans. The vast extent of the continent, the natural obstacles to travel, and above all the hostility of the people to the Christian Europeans, have had the effect of limiting our knowledge in a great measure to the reports, often contradictory, of venturesome travellers.

1. **Extent**.—The extreme points of the continent are, on the north, *North-East Cape*, lat. 78° north ; on the east *East Cape*, longitude 170° west ; on the south *Cape Romania*, lat. 1.5° north ; on the west *Cape Baba*, long. 26° east. Asia is a triangle in form with the base extending between the two last-mentioned capes, and its apex at Behring Strait ; it contains over 17,000,000 square miles, an area larger by two millions of square miles than the two Americas together.

2. **Physical Features**.—The Axial Plateau (see page 8, sec. 4) varies greatly in breadth and elevation. Narrow in the west, and with a height never exceeding 7,000 feet, on reaching the Persian Gulf it rapidly expands into the “plateau of Iran” (Persia and Afghanistan) ; but on the borders of India, at the Soliman mountains, it suddenly contracts again, but rises into the lofty rugged steppe of Pamir—the crossing place of the *Himálaya* and *Thian Shan* mountains. From this point a rapid and continuous expansion takes place till the ocean is reached,—but with very marked features. Supported by the *Himálaya* mountains on the south and the almost equally massive *Kuen-Lun* on the north, the whole of the south-west portion of this region is the vast *plateau of Tibet* rising from 16,000 to 20,000 feet above the sea ; while in the north-west and north is the *desert of Gobi*, a sandy and rocky waste, which in its lowest part is only 2,000 feet above sea-level, and is but the barren bed of a dried-up sea. East of these two regions the country slowly falls off to the ocean.

3. **The Mountains** of the plateau are numerous and run, as a rule, parallel to the trend of the plateau, but very many cross ranges exist, and as a consequence very many mountain-enclosed districts. The *Caucasus*, a broad, massive, well-wooded, and rugged range, enclosing many great glaciers, rise boldly from the Black Sea coast but fall away to low hills near the desert shore of the Caspian, Mt. Elburz, 18,526 feet high, being the culminating point. The *Taurus* range in Asia Minor, never exceeding 10,000 feet in height, is continued into north-east Armenia where Ararat, a volcanic peak 17,112 feet high, extends far into the region of perpetual snow. The *Elburz* range, south of the Caspian, and equalling the *Caucasus* in height, has abundant rain on the north side, and is there well wooded and deeply scored by mountain torrents; the south side is dry, treeless and almost unbroken. The *Soliman* mountains are low but rugged; the famous Kyber Pass from India to Afghanistan is in the northern part of the range. The *Himálayas* form the southern face of the Tibetan plateau; seen from the plateau they are of moderate or even small elevation, but from the plains of India they appear as they are, the most massive and gigantic mountains in the world. Very many peaks are over 20,000 feet high, while Mt. Everest, 29,002, is the highest in the world. Starting in swampy ground from the plains of India a hundred miles from their crest, the *Himálayas*, or "snowy mountains," support more than one outer range on their sides, are scored by huge ravines, abound in glaciers in the upper regions, and are crossed only by passes 18,000 or more feet high. Except in the dry west, they are well wooded; perpetual snow begins on the south side at an elevation of 16,000 or 18,000 feet, and on the north at 20,000. The northern face of the Tibetan plateau is formed by the *Kuen Lun*, a range only less massive and gigantic than the *Himálaya*. The *Thian Shan*, another massive range, extends north-easterly, succeeded by the *Altai* and its continuation the *Fablonoi* range.

4. **Plains.**—All northern Asia is a plain of which the plain of Europe is only a part. Broken by numerous ranges of low hills in the east, it is level in the west, with here and there broad steppes; but the whole of the northern part is the barren tundra of European Russia. Northern India, the southern valley of the Euphrates, north-eastern China and central Manchuria are also plains.

5. **Deserts.**—Beginning with eastern Asia Minor, and scarcely interrupted by the mountains of Armenia and the mountain-masses in the region of Pamir, deserts stretch along the plateau nearly to the Sea of Japan; even Tibet consists largely of arid plains; while outside the plateau are the Arabian, Syrian, and Indian (north-west central India) deserts, and the deserts of Central Asia. The southerly winds can bring but few rain-bearing clouds to the western part, while the *Himálayas* by their great height prevent almost all moisture from passing over their summits to the regions beyond.

6. **The Mineral** wealth of Asia is almost unexplored; the useful metals are known to be wide-spread; *gems* are found in India, Indo-China, and Turkestan; *coal* exists in both Indias and China, in the latter in vast quantities though mined but little; *petroleum* is abundant in the Euphrates valley, in Turkestan and Indo-China.

7. **Outlines.**—The irregularities of outline in Asia have a boldness and sweep not seen elsewhere:—the projections are masses of land—*Asia Minor*, *Arabia*, the *two Indias*, and the less decided ones of *China*; only here and there is found the typical peninsula,—*Malacca*, *Corea*, *Kamchatka*. The north coast, almost wholly unknown, is doubtless of the usual indented alluvial type. Of the

Capes the chief are *Romania* near Singapore, *North-East*, *East*, *Lopatka*, *Comorin*, and *Baba*.

8. **Islands**, other than the East India Islands, line the whole eastern coast and are numerous in all the surrounding waters. Except the smaller ones to the south, which are coralline, they are all continental in character, and have been regarded as a partly submerged mountain chain. The chief islands are the *Kurile* group, the *Japan* group and *Saghalien*, the *Loo-Choo* group *Formosa*, *Hainan*, the barren semi-volcanic *Andaman* and *Niobar* groups, the coralline *Lakkadiv* and *Maldiv* groups, with *Ceylon*. In the north are *Wrangle Land* and *New Siberia*.

9. **The Coast Waters** of the east—*Behring*, *Okhotsk*, *Japan*, *Yellow*, and *China Seas*—are due mainly to the islands that cut them off from the ocean; the *Bay of Bengal* and the *Arabian Sea* are parts of the Indian Ocean: the shallow and narrow *Red Sea* and *Persian Gulf*, the former now a highway of commerce, are wholly land-locked and filled with coralline islands. Minor gulfs are *Tonquin*, *Siam*, *Mandalay*, *Oman*, and *Aden*. The chief Straits are *Malacca*, *Palk*—made almost impassable by a coral reef across it,—*Ormuz*, and *Bab-el-mandeb*.

10. **Rivers.**—Asia, gigantic in everything, is such also in its rivers, which are among the largest in the world. The *Obi*, *Yenisei*, and *Lena* of Siberia are all navigable to the foot of the mountains; the lower course of these rivers does not thaw so soon as the upper; hence great inundations with vast areas covered with sand, gravel and boulders, and hence too the vast depth of the frozen ground in the north; the *Amur* and *Yangtsi-kiang* are large navigable streams, while the great *Hoang-Ho* passing through an alluvial plain in its lower course, has the characteristics of such rivers—*islands*, *sand bars*, a shifting bed. The *Cambodia*, *Irawadi*, *Menam* and others of Indo-China lie between the mountain spurs sent down from the plateau. The great *Ganges*, *Bhramaputra*, and *Indus*, each nearly 2,000 miles long, receive their upper waters from southern Tibet and the glaciers of the northern slope of the *Himálayas*, cross the *Himálayas* through fearful gorges—that of the *Indus* being, it is said, 14,000 feet deep,—pass, in their lower courses, through alluvial plains which they overflow in the flood season, and by branching out into innumerable and intricate, but usually navigable, channels form great deltas,—that of the *Ganges* being 240 miles long.

In the west the only great rivers are the *Euphrates*, 1,300 miles long, and its affluent the *Tigris*,—mountain rivers in the upper part of their course, but alluvial plain rivers with their usual phenomena in the lower part.

Throughout the whole of the plateau, including *Asia Minor*, northern and central Tibet, and the Gobi desert region, together with *Arabia* and Central Asia, nearly all the streams fall into lakes with no outlets (and

consequently salt), or are absorbed by the desert. Of these rivers the largest are the *Tarim* falling into Lob Nor lake in the Gobi desert, and the *Syr-Daria* (Jaxartes) and the *Amu-Daria* (Oxus) falling into the Aral Sea.

11. **The Lakes** of Asia do not appear to be numerous, and they are mainly salt. *Baikal* in the Altai mountains is the only large fresh-water lake; it is 400 miles long and 50 broad, has valuable fisheries, and is an important commercial route with China. The chief salt lakes are the *Caspian Sea* and the *Aral Sea*. The former, about 740 miles long and from 210 to 430 broad, has its surface 84 feet below sea-level; the northern part, owing to the sediment from the rivers, is shallow, but elsewhere the depth varies from 300 to 500 fathoms. The water in the north, especially when the rivers are full in spring, is drinkable; elsewhere it is less saline in the open sea than ocean water, but along the shelving shores and in shallow inlets it is intensely salt; salt lakes occur in the neighborhood of the sea, from many of which, notably lake *Elton* to the north, vast quantities of salt are obtained. Fish and seals abound in its waters. The shores except in the mountain regions are in the main low and desert. Separated from the Caspian by a low plateau with bold edges at each lake, is the *Aral Sea*, 265 miles long, 145 broad, nowhere much over 200 feet deep, and said by recent explorers to be 250 feet below the surface of the Caspian. Its waters are only brackish and abound in fish. To the east is a desert, to the north a shelving steppe, to the south an alluvial plain. Russian steamers ascend far up the *Amu-Daria* from this lake; but heavy north-east winds are prevalent and make the navigation here as well as in the Caspian very dangerous. The minor, but still large, salt lakes are *Balkash*, *Van* in Armenia, *Urumia* in Turkestan, and the *Dead Sea*. The last, 46 miles long and 9 wide, lies 1,308 feet below sea-level; its waters are too salt to support animal life, but they are clear and blue. The shores east and west are very steep but deeply scored with ravines; mineral and asphalt wells abound around the edges, and pestilential marshes are numerous. The whole surrounding region, even the Jordan valley, is a desert. (See page 17, sec. 31.)

12. **Climate.**—North of the plateau, the full exposure to the north without the modifying influence of a great body of warm water at the south, makes the climate more extreme than in the plain of North America. Northern Siberia is the coldest spot in the world; in the south-western deserts the extremes of -30° in winter, and 110° in the shade in summer are common. As great extremes are found on the Tibetan plateau, while the low dry elevations have as great heat as south-west Siberia but not as great cold. The cold north-east Siberian winds, somewhat modified, sweep over even Arabia and the Red Sea in winter; on the southern slope of the plateau the climate is warm, unvisited by great cold. South of the Himalayas, the climate is tropical but modified on the plateaus; the Pacific coast has a warm, equable climate in the south, but severe towards the north. Moisture is fairly distributed away from the deserts. (See page 29, sec. 16; page 32, sec. 29.)

13. **Vegetation.**—Forest growth in the dry regions is sparse, but luxuriant elsewhere; nothing can exceed the luxuriance of vegetation in north-eastern India and Indo-China: man and plant are in constant strife. The

palm is the one tree of the sandy wastes. (See page 36, sec. 2.)

14. **Animals.**—Through lack of moisture and vegetation animal life in Asia is far less abundant than in South America; but where vegetable life is abundant, there also animal life is abundant. (See page 38, sections 6 and 7.)

15. **Inhabitants.**—Apart from the conquering English and Russians only two types of mankind exist in Asia, the *Mongoloid* and *Melanochroi*; the former, in many varieties, all north of the plateau in the west, and of the Himalaya mountains in the east, including all east of the Brahmaputra; the second, elsewhere. (See page 40, section 12.)

Except in the densely peopled Indias and China Proper, and perhaps Manchouria, nomad tribes are found more or less everywhere, wandering from place to place with their flocks and herds and household goods, and yielding only a qualified obedience to the rulers of the country, where there is any general government. In Siberia and Turkestan under Russian influence some of these tribes are beginning to take up a settled abode.

16. **In Government** there are two native types: the *absolutely despotic* in Turkey, Persia, Indo-China, and China; and among the nomads the *patriarchal*, the authority of the hereditary chief being limited by custom alone. Civilization, where not due to Europeans, seems to have almost everywhere retrograded; the nomads, are as they ever were—barbarians. Of the industries, except in China and India, none have reference to foreign commerce. In religion, all of south-west Siberia and all Asia west of the Soliman mountains is Mahometan; India is Brahmin, with many Mahometans; Indo-China and the Chinese empire generally, are Buddhist; Siberia has a kind of ancestor worship, with many other varieties.

POLITICAL DIVISIONS.

1. **TURKEY.**—The north and east of Turkey,—Asia Minor, Armenia, Kurdestan,—belong to the plateau region; the rest consists of three districts. The western part, or Palestine, is a narrow low plateau shelving to the Mediterranean and to the Syrian desert, and ending southward in a desert. It is traversed by the generally low Lebanon range, which in the north is well wooded, but sinks in the centre to low barren rugged hills that finally end in the Sinai group in north-western Arabia. The *Jordan* river and Dead Sea occupy scarcely more than a broad ravine in this plateau, desert in its southern part but with abundant vegetation elsewhere. To the plateau succeeds eastwardly the plain of Syria, with its numerous streams and its fertility in the north, but in the south a desert. Eastward of the desert is the narrow Euphrates valley,—a plain of great fertility but needing irrigation, through lack of which it is now largely desert in character, once the seat of mighty, conquering nations.

2. **Moisture** is nowhere abundant except perhaps in the low, narrow, rich plains skirting the base of the plateau of Asia Minor. Where irrigation is possible or is practiced, the crops are most excellent—wheat, dhurra, olives, figs, pomegranates, grapes, gourds of many kinds, with dates in the low, drier districts away from the coast. The cultivation of these with the care of sheep, occupies most of the settled population. What little trade there is consists in the export of dried fruits, oil and wool. The whole country languishes under the capricious rule, or lack of rule, of the Turks.

3. **The Population** is very mixed; Greeks are the merchants in Asia Minor; Jews, Turks, Arabs inhabit Palestine; the last are found everywhere and are mainly settled except the nomad and barbarous Bedouins; the Armenians are settled and christianized; the Kurds are unsettled and almost barbarous.

4. **The Chief Cities** are *Smyrna* (200,000), *Damascus* (200,000), *Bagdad* (180,000), *Aleppo* (120,000); *Jerusalem*—unimportant except from its hallowed associations; *Beirut* and *Bassorah*. Of these *Smyrna*, *Bassorah* and *Beirut*, the only ports, have considerable foreign trade; the others have internal traffic, and *Damascus* and *Bagdad* a good deal of manufacturing in embroidery, gold and silver work, and implements of fine steel.

1. **ARABIA** continues the Palestine plateau broadened. As far as is known the central part is occupied by a range of mountains or mountain plateaus and deep valleys; here a moderate moisture gives rise to many springs and streams, which are used for irrigation, and in consequence there is an abundant vegetation and a numerous population. East, west, south, and north of this lies a desert, broad and sandy in the south, narrower and stony elsewhere,—the whole comprising about a third of the country. Low mountain ranges skirt the coasts, and are barren and forbidding on their seaward side; on their inward side in the southern half of the peninsula, but more especially in the south-west, or Yemen, there is abundance of water, and in consequence, fertility and productiveness. In the north-west, or Hedjas, the only moisture comes from wells, themselves often brackish,—a hopeless, stony region; in the south, or Hadramaut, oases exist beyond the fringing mountains, some of large size. The east coast is less barren than the others though sandy tracts are numerous.

The heat of the south-west is often intense; in the north west snow covers the tops of the Sinai range in winter.

2. **Agriculture** is very rude. The plants cultivated are the *date palm* in the central half, *coffee* in Yemen—the products of which alone are exported; some wheat and barley; millet, garden plants especially of the gourd kind, beans, with rice in the east. The domestic animals are the famous Arabian *horse*, the more useful *camel*, the ass and sheep, both in great numbers, with some cattle. Of wild animals tigers are found, hyenas, wolves, jackals, deer, and monkeys, with insects and some poisonous serpents, locusts being very abundant. Birds are very numerous, for Arabia is a winter home of northern birds of passage; while ostriches abound in the southern deserts. *Pearl fishing* is important in the Persian Gulf. In Oman in the south-east, gold and silver articles often of great beauty, embroidery in gold and silver, fine cloths, and implements of steel are quite extensively made; elsewhere, except in Yemen, the *manufactures* are domestic and as a rule coarse.

3. **Of the Inhabitants** (estimated at 9,000,000) the *Bedouins* are nomads, poor and half barbarous with barbarian virtues and vices; the settled Arabs are industrious, clever at mathematics, fond of the wonderful, grave, polite, apt to be revengeful, fond of learning, patriotic, simple in their habits, brave, hospitable and tolerant except to Christians. They are all Mahometans.

The *government* is patriarchal among all classes, but strictly so with the Bedouins; with the others, the Koran forms the civil code as well as the religious; the rulers decide by its teachings or by their own sense of right. The Turks have established a sort of authority over all the west coast.

4. **The Cities** are all mean, the houses having walls of mud or sun-dried brick. *Mecca* is the chief holy city, and *Medinah* next in sanctity; *Moka* exports coffee; *Muskat* is the chief commercial city; *Aden* is a British stronghold in the south-west.

1. **PERSIA**.—The country west and south of a line drawn from the western Caspian coast to the Indus river in India, parallel to the axial curve, is a region of mountain chains separated by valleys or by plains. The plains are sandy deserts; the valleys, and the mountain-valleys as well, are fertile and cultivated, watered mainly through irrigation, the mountain streams being all utilized for this purpose. The higher ground of the north-east is largely a sandy, barren desert, but including short ranges and some oases; only in these places is cultivation possible in this region.

2. **The Rainfall** is small everywhere, but increases towards the north-west, the mountains there being higher; consequently there are no forests; in the south the greatest fall of rain is in the higher mountains inland, for the coast has only low ranges and hence gets little moisture. The slope from the Elburz to the Caspian is very moist and unhealthy, while dense forests of trees, similar to those of south-western Ontario, cover all but its drier eastern part. There are some rivers in the west, one, the *Kurru*, being navigable, and having a low rich plain in its lower course; in the south there are mere brooks. *Monsoons* (rain bearers) from the sea blow violently along the mountain ranges in summer, followed by as violent winds from the north-west in winter.

3. **The Productions** are all those of southern Spain—fruits and flowers (especially roses) being in great abundance. The domestic animals are those of Arabia, and the wild animals as well, together with the lion and tiger. The Persians show great skill in *manufactures* of all kinds, the shawls and carpets being especially fine. The exports are chiefly opium, wheat, silk, furs and dried fruits.

4. **The Inhabitants**, about 8,000,000, are of many races; numerous nomads of various kinds, Turks, Armenians, Kurds, Arabs, Afghans, Biluchis, etc., besides the Persians proper. Nearly all are Mahometans, but there are some Guebbers (fire-worshippers) and some Christians. The *government* is wholly despotic. *Schools* exist in the towns and villages but are inferior. Slavery exists here as also in Afghanistan.

5. **The Cities** are of the same character and structure as those of Arabia, but with some finer public buildings. The chief are *Teheran* (200,000), the capital, *Tabriz*, *Ispahan*,—the chief centres of trade,—*Kerman*, and *Shiraz*; *Bushire* is the chief port.

BILUCHISTAN is in most respects like southern Persia. The tribes are independent or give a doubtful submission to some powerful Khan, the chief being the Khan of Kelat. The Biluchis are a fierce, daring race given to plunder, patient of hunger and thirst, and like the Afghans are revengeful. *Quetta* is a British station and fortress on the northern border of the country.

1. **AFGHANISTAN** possesses all the physical characteristics of Persia; the south is the lowest and hottest and the most completely desert part; the north-east,

over 5,000 feet above the sea, shows great variations in temperature, the thermometer in some places ranging from -15° in winter to 120° in the shade in summer. The country around Herat is fertile, well watered and possesses a fine climate, with some snow occasionally in winter. Winds are heavy and in the deserts in summer give rise to dust storms; rain occurs chiefly in winter and spring, for the monsoons are unfelt except as they pass from India up the valley of the Kabul river. This valley is the highroad to India, the Kyber pass lying in it.

2. The Productions and animals are like those of Persia. *Minerals* are said to be abundant, but only iron, some antimony and lead are mined. The extent of trade is unknown. Some horses, carpets, and woollen stuffs are exported to India.

3. The Afghans are a fine athletic, handsome race, but are said to possess few attractive characteristics beyond bravery and independence of spirit. They are notoriously treacherous, revengeful, cruel, and turbulent. They are ruled over by a military chief to whom no very marked obedience is paid except by force. There are very many tribes, each having its own chief, but he is powerless to act except by the consent of the tribe. Nomads are numerous, but dwellers in villages form the majority. All are Mahometans. *Population* about 4,000,000.

4. The Chief Towns are *Kabul, Herat, Kandahar, Ghazni, and Jalalabad*; all have important fortifications.

INDIA.

1. Physical Features.

—Southward from the Vindhya Hills, which lie near the tropic of Cancer, the peninsula, termed the Deccan and Mysore, is a plateau supported on the west by the Western Ghats and sloping off to the lower Eastern Ghats, the east face of the plateau; near the south the latter range curves westward to meet the former, a low mountain mass called the Nilgiri Hills being thus formed. Hills and low ranges of mountains exist on the plateau, giving rise to several important streams, the Nerbadi and Tapti on the west, the Mahanadi, Godavari, Kavari, and Krishna on the east. The coasts are fringed by narrow rugged

plains, the Malabar, or western, coast being narrower than the Coromandel, or eastern, coast—the Carnatic. North of the plateau is the great alluvial plain of India, nowhere over 1,000 feet above sea-level, and wholly devoid of stones, in its western part is a desert extending almost to the Indus; its northern border at the foot of the sub-Himálayas is fringed by a wide dry belt of gravel and shingle washed from the mountains by torrents; outside of this is a belt of swamp, with a luxuriant growth of reeds, grass and jungle, the home of fevers as well as of the tiger and other beasts; the eastern part is almost wholly formed of the sedimentary deposits of the Brahmaputra, Ganges and Mahanadi. The lower delta of the Ganges is a vast jungle infested by tigers and crocodiles.

2. The Coast is unbroken except on the west, at the Gulf of Cambay and Cutch and the Run of Cutch—a low tract covered with water only during the monsoons. There are some harbors on the west, but in the east there are only open roadsteads, while coral reefs and heavy surf line the shore.

3. The Climate is dry; only on the Western Ghats and in the north-east, including the central and eastern Himálayas, is the rain abundant (see page 32, sec. 23); everywhere else irrigation is resorted to, and tanks and

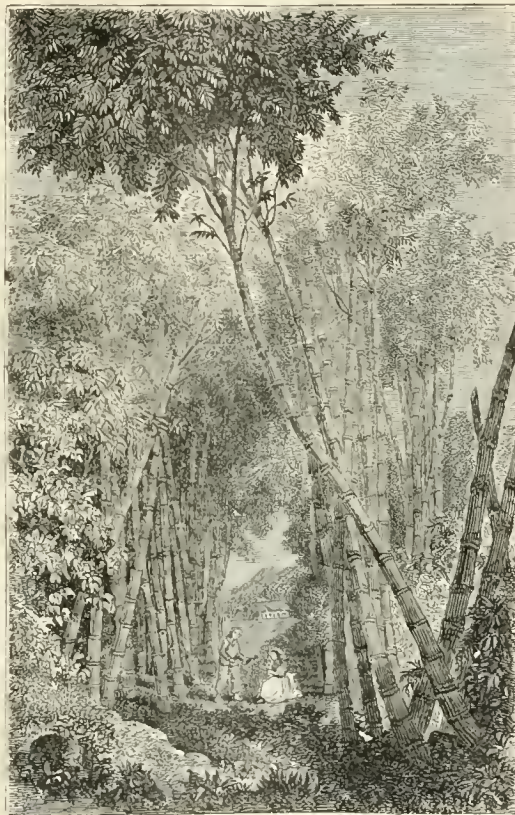


FIG. 50.—BAMBOO GROVE.

dams are made to store up the water of the rainy season. Apart from the desert the least rain falls in the west; there the floods of the Indus are almost the sole dependence for moisture, and many bare hills and peaks appear even in the Himálayas. A failure of rain for two years produces a famine. (See page 29, sec. 16.) India on the whole is the hottest country in the world. The heat is greatest in the coast regions and the plain



especially in the west and east—intense dry heat in the west, moist oppressive heat, “a vapor bath,” in the east. The hills are greatly resorted to in summer. The summer monsoons are usually violent; terrific thunderstorms occur on the west coast and fearful cyclones on the east at the change from the winter to the summer monsoons. This is the hottest part of the year, 100° being the mean temperature in the Punjab. In winter the breezes are gentle and the temperature delightful; then the Punjab often has frost.

4. **Vegetation.**—Of forest trees varieties of acacia are abundant in the dry regions; in the others palms of every kind, with the cocoa-nut palm near the sea-coast; the banyan, india-rubber and other trees of the fig family; the teak, light, firm and not subject to decay—the most valuable of all woods for ship-building; bamboo and cane in immense jungles; the fragrant sandal-wood in the south, and fine pines and cedars in the Himālayas. Wheat is cultivated largely in the Punjab and along the upper Ganges; rice, maize, peas, beans, gourds and millet, oranges, pineapples, plantains, cotton, hemp, jute, indigo, poppies, etc., are all extensively raised.

5. **In Industries,** *Agriculture* is the chief, but *Manufacturing*, always important, is growing fast. Sugar, indigo, silk, opium; beautiful gold and silver work; silk, woollen and cotton fabrics of unequalled fineness and beauty are some of the principal products of native Indian handicraft. The exports are opium, cotton, seeds, wheat, rice, indigo, jute, coffee, tea, sugar, etc.; the imports are chiefly cotton goods and metals. The trade is nearly all with Great Britain and China.

6. **Minerals** are plentiful, consisting of coal, inexhaustible though somewhat inferior in kind, iron, lead, copper, silver, antimony,—in the Himālayas,—salt and nitre in the Punjab and north, and some precious stones, but no valuable diamonds.

7. **The Inhabitants**, numbering 254,000,000 in 1881, are of two chief races, the Aryan (page 46, sec. 12. last paragraph), and the non-Aryan of southern India, called collectively the Dravidians; some of the languages of the latter are highly cultivated, the Telugu and Tamil especially. In religion 188,000,000 were Hindus, 50,000,000 Mahometans, nearly 2,000,000 Christians, some Parsis (fire-worshippers), with many others. *Education* is backward, but schools are wide-spread, supported by government. The people of India, excepting the wild hill-tribes, have a high degree of civilization, and their literature is one of the richest in the world; they are an intellectual race. Industrious, honest, attached to their native village, they bear a character for treachery, deceit and cunning which, some declare, is not merited.

8. **In Government** India is a dependency of Great Britain and is ruled over by a viceroy and council responsible to the home government; it has its own army, navy, revenue, mint, etc., etc. Great Britain really derives no revenue from India. There are many political divisions, Bengal, Madras, and Bombay being the chief. Of the area, 1,383,500 square miles, Great Britain directly governs about two-thirds; the rest is more or less under the same control; there are no really independent states. The chief native states are Punjab, Rajputana, Hyderabad (Nizam's Dominions), Mysore, Baroda, Nepal, Bhotan, Kashmir; the last three are among the Himālayas.

9. **Cities.**—In 1881, twenty-one cities had over 100,000 people each, and forty others over 50,000 each. CALCUTTA, the capital (872,000), Bombay (773,000), Madras, Hyderabad, Lucknow, Benares—the sacred city of the Hindus,—Delhi, Patna and Agra are the chief cities.

10. The French own Pondicherry, Chittagong, Mahé and a few other places; the Portuguese, Goa and a few small towns on the west.

11. **Ceylon** is a separate government—a crown colony. Physiologically like India, it has an abundance of moisture, and raises coffee,

tea, spice, cinchona, cocoa, etc. The people, chiefly Buddhists in religion, number about 2,800,000. Colombo, Kandy and Trincomali are the chief places.

INDO-CHINA

1. **Physical Features.**—Indo-China is the southern slope to the sea of the great interior plateau. High and rugged in the north, and traversed by mountain ranges, one of which is prolonged almost to the equator, it consists in the east and south of alluvial plains formed by the overflow of the great rivers, each with its wide-spread delta, that descend from the plateau between the mountain ranges; the west is bolder, for here the mountains border the sea.

With moisture in superabundance and with continuous heat, vegetation except in the hill country is luxuriant beyond conception: the mountains in the south are impassable from the density of the jungle. Valuable timbers, teak especially, and palms, including the cocoanut and sugar palms abound everywhere; while cotton, indigo, tea, tropical fruits of many kinds and in great abundance, rice, wheat, millet and maize are the cultivated plants. (See page 36, sec. 2 (1, 2); page 38, sec. 7.)

2. **The Mineral** wealth seems to be very great, but only tin and iron are mined to any extent; gold and silver and coal are found, and several kinds of precious stones; petroleum has long been in use in Burmah.

3. **Agriculture** is the chief employment, but there is considerable *fishing* and coarse *manufacturing* for home purposes; silk goods, gold and silver work and lacquered ware are often very beautiful. The exports are mainly rice, cotton, timber, and tea (north-west). The governments are despotic; education is low; religion is wholly Buddhist.

4. **Political Divisions.**—In the west BURMAH now belongs wholly to Great Britain, and is governed by officials from India; area about 278,000 square miles; population, 6,000,000. The chief cities are Rangoon, Mandalay and Bhamo. SIAM is a strong, prosperous and enlightened kingdom: the area is about 250,000 square miles; the population, 6,000,000. Its chief city is Bangkok. CAMBODIA is a kingdom south of Siam, under control of Siam and France. COCHIN-CHINA, or ANAM, in its southern part is owned by France and its northern part, Tong-king, is under the control of the same country. The MALAY PENINSULA consists of a number of partly independent native states, controlled somewhat by Great Britain and Siam, and of some British possessions known as the STRAITS SETTLEMENTS—Malacca, Singapore, Penang, Wellesley. Singapore on an island of the same name is an important trading city. In climate, productions, people, etc., the peninsula belongs to the islands rather than to the continent.

CHINESE EMPIRE.

1. **Extent, etc.**—This vast empire, so varied in its physical characteristics (see Asia, sections 2-5), is the third in size in the world; its area is given at over 4,000,000 square miles, and its population at over 404,000,000; but only China itself is tolerably well known to Europeans. The dependencies of China are Manchooria,

Mongolia, East Turkestan, and Tibet. Corea owns the supremacy of China by sending tribute every year to Peking.

2. **Minerals** seem abundant everywhere in the hill countries; but only precious stones, gold, copper, and mercury are mined to any important extent. China Proper has the greatest coal-fields in the world, but Tibet is destitute.

3. **Productions.**—Wherever there is sufficient moisture the soil yields abundantly; the lofty dry plains of the Tibetan plateau produce only grass and shrubs, but its numerous valleys, especially the deeper ones where water is available, yield the grains and fruits of temperate climates; the sides of the mountains that surround the Gobi desert are likewise productive, while irrigation at the base often absorbs large streams. Turkestan with its fine climate is said to be wonderfully productive not only of wheat, maize, peaches, and grapes, but of figs, oranges, cotton, rice and even sugar-cane. China contains everything within itself; its great size, estimated at 1,300,000 square miles, extending over twenty degrees of latitude with a very varied elevation, gives it every climate except the hottest, and every production of Europe, while in its tea plant it supplies a necessary of life that Europe or America does not

afford. Its great products are *tea*, which is universal, *rice*, the staple food, *silk*, *cotton*, *sugar* and, of late, *opium*; *bamboo* is of unlimited use—houses, furniture, utensils, clothing, paper, rope, all being made of it.

4. **Industries.**—The Chinese excel in fine *manufactures*—silks, gauzes, porcelain, minute carving, filigree work, embroidery, bronze and lacquered ware, etc., while in western Tibet and Turkestan are made the fine shawls from the silky hair of the Kashmir goat; these countries, especially Tibet, furnish the wool for the numerous and often fine woollen fabrics of China and Tibet; but agriculture is the chief pursuit everywhere.

The foreign trade though large is insignificant in comparison with the internal trade—a trade conducted wholly by caravans, for there are no railroads as yet. Tea is the one great export, but raw silk and sugar are important; cotton and woollen goods, opium and metals are the imports. Great Britain and her colonies have over two-thirds of the trade.

5. **The Population** is dense in China, being variously given at 282,000,000 to over 400,000,000; elsewhere except in Manchuria it is sparse. The Chinese, the typical people, are peaceful, industrious, practical, stoical, and sober; their civilization is high and of very ancient date, but not progressive; *Education* is wide-spread; *Buddhism* is the prevailing religion except in Turkestan; the *Government* is a paternal despotism.

6. Of the **Cities**, some of which are beautiful, four have over 1,000,000 inhabitants each: fourteen over 500,000; twenty over 200,000. Vast numbers of the people live on boats or rafts on the rivers and lakes. The English are permitted to trade at only twenty-two ports, *Canton* (1,600,000), *Tientsin* (950,000), *Hankow* (700,000)—about 700 miles up the Yang-tee-King, *Funchow* (630,000), *Shanghai* (350,000), are the largest of these. *Pekin* (over 1,000,000) is the political capital. *Lhassa* in Tibet is the sacred Buddhist city; *Yarkand* and *Kashgar* in Turkestan, are large cities with overland trade to the west. *Hong-Kong*, near Canton, is an island belonging to the British; its trade is very great, Chinese being the chief merchants. It is the principal naval and military station of Great Britain on this coast.

JAPAN

1. **Physical Features.**—Japan with an area of 148,456 square miles, and a population of over 38,000,000, is an empire of islands—Yezo, Hondo (Nippon), the largest, Shikoku and Kiushiu being the chief. The surface as a whole is hilly, but there are very many plains of considerable size. Short mountain ranges, and isolated peaks are numerous, many being volcanoes; the highest peak, (Fusiyama), a volcano, is over 12,000 feet high. Earthquakes are very frequent.



FIG. 81.—TEA PLANTATION.

Streams are numerous and are largely employed in irrigating the rice fields. The coast is very varied in character, but the innumerable islands and reefs render navigation in its neighborhood dangerous.

2. **The Climate** varies from the low temperature, winter and summer, of the Kurile Islands, to the tropical heat of the south. Southerly winds prevail, and typhoons often occur. Along with the ordinary northern productions are rice,—the staple food; tea and silk; the camellia and wax trees, and the bamboo—as useful here as in China. The domestic animals, except sheep, are numerous; wild animals are few, the monkey being most common. Fish abound and form the chief animal food.

3. Of the **Industries**, agriculture is the chief; fishing occupies over 1,600,000 people; mining, especially of copper, iron and coal, is quite extensive, along with some gold and silver. Manufacturing, of the same character as in China, is quite extensive. Japan exports tea, silk, silk-worms and eggs, rice, coal and copper; and in ports cotton and woollen goods, sugar, etc.

4. **The Inhabitants** are clever, industrious, more warlike than the Chinese, eager to learn, and are good soldiers and sailors. Of late old prejudices have been abandoned and the arts and sciences of western Europe are being rapidly introduced, while students go abroad, chiefly to England, France and the United States, to study in those countries. Schools of all kinds are established everywhere. The government is absolute, but paternal. Buddhism as yet is the chief religion, but Christianity has many followers. Japan has a strong navy.



FIG. 52.—JAPANESE TOWN.

5. **Five Cities** in 1884 had over 100,000 inhabitants each. *Tokio* (903,000), the capital, is the largest. *Osaka* (354,000) is the great commercial city. *Yokohama* has most foreign trade; the last two with *Hakodati*, *Nagasaki* and the smaller *Kobe* and *Nuyata*, are the only ports open to foreigners.

SIBERIA AND CENTRAL ASIA.

1. **Physical Features.**—This vast region, which with Transcaucasia, the north-eastern part of Armenia, forms the Asiatic dominions of Russia, has an area of nearly 6,500,000 square miles, but a population of less than 16,000,000. All north of the parallel of 50° falls off to the Arctic Ocean, but to the south of that parallel the slope from north, east and south is to the great central depression in which lie the inland waters of Central Asia, as well as the southern border waters of Europe. Here only two rivers cross the deserts, the others are lost in the sands and form marshes where they disappear.

2. **Minerals** seem abundant in the mountains of the south-east and of Central Asia, copper and iron in the former, and the same, with gold, silver, precious stones and others in the latter.

3. **The Climate** down to the border of the desert regions (lat. 48°) scarcely differs from that of North America in the same latitudes; but in the desert region the extremes of heat and cold are far more severe, except in the south, than those in a similar latitude in the Mississippi basin, and the rivers are all frozen over from three to four months in winter.

4. **Productions.**—Only arctic vegetation is found north of the parallel of 60° in East Siberia; but in the west barley and oats grow somewhat farther north, and a fine agricultural region exists in all other parts of the plain. In Central Asia wherever there is water, there is a luxuriant yield of all the grains, fruits and garden vegetables, and the cotton, rice, and silk, of southern Europe. Khiva and Merv are the chief fertile districts in the desert, and in them as well as in the neighborhood of the mountains, irrigation is extensively resorted to.

5. Of the native **Inhabitants**, all Mongoloid, those of the north and east, who are closely allied to the Finns in Europe, are half nomadic hunters and fishers, mainly heathen; of the rest, mostly of the Tartar family and all strict Mahometans, the greater part are nomads, rearing horses, sheep and camels; some of these in Central Asia are settled in towns or villages, and either are agriculturists or they manufacture silks, shawls, carpets, gold and silver work and coarse articles of wool, cotton, and camel's hair. Russia uses Siberia as a place of transportation for criminals, largely political offenders; these and their descendants occupy the cities of Siberia; the worst class work in the mines; others are hunters or farmers. Grain and furs are the main exports of Siberia, but the transport trade to and from Europe and China is quite important.

6. Of the **Cities** *Tobolsk* and *Tomsk* are the chief in Siberia; *Khiva*, *Merv*, *Kokand*, and *Tashkend* in Central Asia. These last cities are of the Persian and Arabian type.

BOKHARA is a large and important trading and manufacturing city of Turkestan, the chief city of a country of the same name, under the influence of Russia but independent as yet. It is the seat of Mahometan learning in Central Asia; many of its schools are good.

AFRICA.

Africa, so long a mystery to the outer world, bids fair soon to become well known. The discoveries and explorations of the last few years have attracted the attention of the manufacturing nations of Europe, and steps are being energetically taken to open up the country for European trade and civilization. Numerous annexations of territory by Great Britain, France and Germany have been made in the vicinity of high-ways to the interior. Great Britain has placed steamers on the Niger and its affluent, the Benue, as also on the lower Zambesi and the Shiré, the outlet of Lake Nyassa, and is building a wagon road from the latter lake to Lake Tanganyika to meet a similar road from the recent German annexations near Zanzibar; while France proposes to build a railroad from Senegambia to the headwaters of the Niger. The Congo Free State will carry trade, and with it civilization and Christianity, to the very heart of the continent.

1. **Extent.**—Africa lies approximately between the parallels of 37° north and 35° south latitude, and the meridians 51° east and 17.5° west longitude; the extremities are the capes Blanco in the north, Agulhas in the south, Guardafui in the east, and Verde in the west. The estimated area is over 11,000,000 square miles, and the population over 190,000,000. The latter is scarcely more than a guess.

2. **Physical Features.**—The southern part of the continent—south of the parallel of 10° north—is a plateau. The main axis (see page 8, section 4), runs at some distance back from the eastern coast, being highest and most massive in Abyssinia, but having its loftiest



FIG. 83.—SCENES IN AFRICA.

peak, *Kilimanjaro*, 18,715 feet, near the equator. The rugged *Drakenberg* range in the south-east joins the *Nieuwveld* range, the southern edge of the plateau. The ranges of the western or secondary axis, are not so high or so massive as those of the main axis; they include the *Cameroon* mountains east of the Gulf of Guinea, and the lower ranges that extend to Sahara. The northern slope of the plateau is almost unknown, except where the Nile breaks through it in a series of rapids and falls.

Between the axes the country is a great, shallow, undulating basin, with here and there low mountain ranges, and with a general incline to the west, except in the south central part: it contains one desert, the *Kalahari*, in the south.

Except in the south there is almost everywhere an undulating plain of considerable breadth fringing the coast; from this the plateau rises in a series of terrace-like hills or low ranges, which support between them subsidiary, but still often quite extensive, plateaus. Falls and rapids mark the passage of streams from one to another of these terraces.

3. **The Desert** extends from the plateau over the whole north of the continent excepting the *Atlas* region and the thread-like groove of the Nile valley. As far as is known, the *Sahara* is a series of low, stony plateaus, with intervening and often great expanses of loose sand. One of these latter, called the *Erg*, fully 200 miles broad, stretches from southern Tunis to near the Senegal river in the south-west; another, south of Barca, extends from the Gulf of Sidra eastward into

Egypt, and is said to be from 100 to 150 feet below the sea level. The desert plateau is known to rise in places into mountain ranges over 5,000 feet high, notably to the south of Tripoli, where such exist across the whole desert, forming Fezzan, the Tibu country, and, farther west, the district of Air (Asben). These elevations are visited by periodical rains, more or less copious according to the height, and in consequence vegetation—palms, fruit-trees, wheat, cotton,—exists along with both domestic and wild animals. These are the habitable parts of the desert, the *Oases*. Sometimes deep depressions in the rocky plateau occur, and here wells are met with, which also give rise to oases; but these often have a very scanty vegetation and brackish water, and often, too, are unhealthy and uninviting.

The trade wind blows steadily from the east during the greater part of the year, but in the hot season the intense heat gives rise to terrible sand-storms.

4. **Minerals.**—*Gold* from the earliest times has been a product of Africa, and modern discovery shows it to be wide-spread; *salt* is equally wide-spread, and *copper* abounds in South and Central Africa; *diamonds* are found in the south. Very little is known regarding *iron* or *coal*.

5. **The Coast** is nowhere flat. The outline is almost monotonous in its regularity; only in the north and in the west is there even an open inlet of consequence, that in the former being the Gulf of Cades and the Gulf of Sidra, in the latter the Gulf of Guinea, with the Bight of Benin and the Bight of Biafra. Harbors are few, for the rivers silt up their mouths: the Congo has the only good harbor on the coast. Only in the east is there a marked projection of the land. Besides the extreme points of the continent, the only important headlands are *Cape of Good Hope*, where the coast bends eastward, *Spartel* at the Strait of Gibraltar, and *Bon* in Tunis.

6. **Islands** are not numerous. In the Atlantic are the lofty *Cape Verde* group, owned by Portugal, with a dry climate and no trees, but with cattle and tropical productions abundant; flat-topped *St. Helena* and *Ascension*, rising sheer from the water, are merely places of call for vessels in want of supplies. In the Indian Ocean are the lofty volcanic *Mauritius* and *Réunion*,

(Bourbon), the first belonging to Britain, the second to France; both are very populous, and produce large quantities of sugar; and both are in the path of the cyclones. The *Comoro* group and the *Seychelles* (belonging to Britain), are also lofty and fertile; like all the islands in these seas they are surrounded by coral reefs. *Zanzibar*, a large fertile island with an industrious and civilized population, is the centre of an important trade with the interior of the continent. Its sultan owns considerable territory on the mainland. The chief town, *Zanzibar*, has over 30,000 inhabitants. *Madagascar* is one of the great islands of the world. Separated from the continent by *Mozambique Channel*, it rises from a low, hot, unhealthy plain, into an undulating plateau, fertile and well cultivated. The people, a Polynesian race, are excellent agriculturists and workers in metal, have considerable civilization, and profess the Christian religion. The exports, chiefly rice and cattle, are important. *Tananarivo* inland, and *Tamatavé* on the coast, are large towns. France claims a protectorate over the island. *Socotra*, belonging to Great Britain, is a large, lofty, generally fertile island, with a mixed population; it is important only as a sanitarium for the garrison at *Aden*.

7. *Rivers*.—Africa has but four great rivers reaching the sea. The *Niger*, over 2,500 miles long, has its headwaters only 200 miles from Freetown on the Atlantic. It sweeps in a great bend north-east to the desert, and then curves to the south-east, forming at its mouth a delta longer than that of the Nile. It is navigable for most of its course, but a considerable part remains to be explored. The *Congo*, 2,900 miles long, under the name of *Lualaba*, leaves the great *Tanganyika Lake* and forms, like the *Niger*, a great bend, crossing the equator twice in its course to the Atlantic. In the high land of its upper waters, and in passing off the plateau, there are many cataracts, the last being *Yallala Falls*, 110 miles from its mouth; but the main part of its course is unobstructed. Its volume of water is very great, hence it is supposed to have many and large, but unknown, tributaries. The *Zambesi*, over 1,600 miles long, starts on the inner side of the western mountains, and has no interruptions till it arrives at the eastern axis; there the great *Victoria Falls* and a long succession of rapids destroy its value for commerce, till the plain on the coast is reached. It forms a large delta at its mouth. The *Nile* is nearly 4,000 miles long. From where it leaves *Lake Victoria Nyanza* on the equator, 4,000 feet above sea-level, to some distance below *Albert Nyanza*, it is a plateau river, one of its falls being the magnificent *Murchison Falls*, 120 feet high. For 650 miles above *Khartoum*, it falls only 300 feet, a sluggish river, often choked with drift, its shores swampy, and with a great weedy lagoon where its first large tributary, the *Ghazál*, joins it from the west. At *Khartoum*, the river, now called *White Nile*, is joined by the clear *Blue Nile*, and farther down by the *Atbara* (*Black Nile*), its last tributary, both from *Abyssinia*; the latter, dry in its lower course in the dry season, brings down the famous *Nile mud*. From the *Atbara* to the sea, over 1,700 miles, the Nile runs in a narrow valley never more than ten miles wide, bounded almost everywhere by steep desert hills of granite or limestone. Near *Cairo* it branches into two main channels, and forms the famous delta, which is about 150 miles wide at its base. A series of six rapids or cataracts, about 250 miles apart, begins at about latitude 17° north, the last being 779 miles from the sea.

Of the other rivers, the *Senegal* and the *Gambia* are each navigable for about 400 miles from the coast. The *Ogawai* and *Coanza* are large but unexplored rivers. The *Orange*, though receiving many tributaries in its upper course, nearly dries up in its lower course in the dry regions; it is not navigable at any time. The *Limpopo*, *Rovuma*, *Rufigi*, *Dana* and *Juba* are all unknown in their upper courses.

8. *Lakes*.—Africa rivals North America in great fresh-water lakes. *Chad*, a shallow lake in the Soudan, 1,100 feet above sea-level, flows off to the desert. With the Nile basin are con-

nected *Dembea* in *Abyssinia*, *Albert Nyanza*, 97 miles long and 22 broad, and the great *Victoria Nyanza*, 230 miles long and 220 broad; with the Congo are connected the *Tanganyika*, 2,600 feet above the sea, 500 miles long and from 10 to 50 broad; also *Moero* and *Benqueolo*. *Nyassa*, 350 miles long, 38 in general breadth, and 1,500 feet above the sea, flows off by the *Shiré* river into the *Zambesi*. *Ngami* is shallow and is apt to be brackish in the dry season; its waters flow off into the neighboring districts, forming salt lakes. Many other, and even large, lakes are known to exist, but they are unexplored.

9. *Climate*.—Africa is almost wholly tropical. The greatest heat is in the desert regions, particularly near the Red Sea, but even here the rapid radiation at night produces an uncomfortable degree of cold. The moisture and vegetation elsewhere moderate the temperature, though in places the steamy atmosphere is less endurable than the dry but healthy heat of the desert. The coast districts of the tropics are very unhealthy to Europeans. Snow falls nowhere except a little in the Atlas mountains, in *Abyssinia*, and the mountains of South Africa; *Kilimanjaro* and *Kenia* near it, reach perpetual snow.

Central Africa for the most part is in the rainy zone, the equatorial regions having two rainy seasons, for the rains follow the sun in its change of place. No part of the desert is absolutely rainless; wherever there is elevated land rain is periodical; elsewhere fierce storms occasionally come, when the sandy and rocky valleys, or "wadys," become furious torrents for the time being; even Egypt gets a shower. Periodical winds blow on the coasts according to the part of the continent being directly heated by the sun.

10. *Vegetation*.—A belt of dense forest seems to extend across the continent for ten degrees each side of the equator, succeeded north and south by a more open and grassy country; the deserts follow, the *Kalahari* with a periodic herbaceous vegetation, the *Sahara* with some occasional coarse, spiny shrubs, the food of the camel; while north and south alike end in an open, productive country. (See "*Organic Life*," sections 1 and 2.) The great tree of the *Sahara* is the date palm, found everywhere away from the sea where water can be reached; its fruit is the staff of life to the desert dwellers, while the gigantic baobab, or monkey bread-tree, with innumerable varieties of palm, except the date, are the typical trees of the moist regions.

11. *Animals*.—The immense grassy, open country everywhere supports innumerable herds of buffalo and of the various kinds of antelope, which are followed and preyed upon by lion, hyæna, jackal and Bushman alike; the striped horse-like quagga and zebra are almost equally numerous to the south; while elephant, rhinoceros and giraffe prefer the groves, the chimpanzee, gorilla and baboon the dense woods, and the hippopotamus the rivers. (See page 38, sections 6 and 7.)

Birds of brilliant plumage abound in the same regions, but the ostrich is found only in the deserts and open country. Of reptiles, serpents are less numerous than in other tropical countries where the rain is more abundant, but crocodiles infest most of the rivers. Fish seem plentiful in all waters inland and oceanic. Insects are scourges; the locust and scorpion are everywhere, the tsetse fly, so fatal to cattle, is in the central parts, as is also the destructive white ant.

The domestic animals are sheep and cattle everywhere, and the camel and goat in the north; the horse is not native, and is not found south of the Soudan.

12. Inhabitants.—North of the Soudan the people are of the dark-white type, and go by the name of *Berbers*; the *Moors* of the north are an intermixture of these with the Arabs and other conquerors, while the *Berberines* of the east are partly of negro blood. The Berbers are a well-proportioned race, having high intellectual qualities. Those of the desert are warlike nomads, and exact tribute from the caravans; those of the north are industrious agriculturists, the greater part living among the mountains. Negroids occupy the rest of the continent. The *Zulu* and other Kaffirs of the south, the *Soudanese* generally, and the people of Uganda and other nations near the great lakes have fine athletic forms, and are capable of high mental development; they have all advanced beyond the mere barbarous tribal government; none are nomads, and all show considerable skill in metal working and cloth making. The *Bushmen* inhabit the south-west, and extend north even beyond the equator; they are a diminutive race, and form the most degraded of the negro family; those of the south are hunters only, others farther north possess cattle.

13. In Religion, the Moors, Arabs, Berbers, many of the Soudanese east and north, and also many in the region of the great lakes, are Mahometans; elsewhere certain charms called "fetish" are alone believed in.

14. Commerce, except in Algeria, Egypt and South Africa, consists in exchanging at the coasts, for European manufactures, gold, ivory, palm-oil, ground-nuts, ostrich feathers, gums, hides and beeswax; but the slave-trade has been entirely suppressed through the vigorous action of Great Britain. Caravans, however, carry slaves, along with gold, salt, ivory and feathers across the desert to the Barbary States and Egypt.

BARBARY STATES.

1. Physical Features.—Of these states—Morocco, Algeria, Tunis and Tripoli—the two western consist, in their central part, of a low plateau terminating in Tunis,

and traversed by the forest-clad Atlas Mountains, which rise from 4,000 to 13,000 feet in height, and by several subordinate ranges that send off spurs on each side; an undulating country falls away from these to the sea and the desert. The coast is in general bold, with few good natural harbors. The streams, somewhat numerous, are everywhere utilized for irrigation before entering the sea or being absorbed in the desert.

The climate and productions north of the mountains are like those of southern Spain; to the south both are tropical, but of the fruits the date is the most important. Tripoli and Barca resemble southern Algeria; but along with dates, figs and oranges, wheat is grown as in northern Algeria. The exports are the natural productions, along with wool, hides and iron from Algeria, and merchandize from the Soudan.

2. The Inhabitants consist mainly of Berbers and Moors: the former, most numerous in the mountains, are mainly agriculturists; the latter, most numerous in the plains, are largely nomads. Jews, who are the traders, are numerous also.

3. Morocco is but little known to Europeans; its government is a pure despotism. The chief cities are *Morocco*, *Fez*, *Mequinez* in the interior, and *Tetuan* and *Tangier* on the coast. The area is said to be 219,000 square miles and the population from 2,500,000 to 8,000,000. Spain owns some ports on the coast.

4. Algeria belongs to France and is making rapid progress in civilization; schools have been established and public works undertaken. The chief cities are *Algiers*, *Oran*, *Constantine*, and *Bône*. The area is about 123,000 square miles, and the population 3,300,000.

5. Tunis is the most fertile of the Barbary States. It is governed by its own Bey, but is under the protectorate of France. The area is reckoned at 42,000 square miles and the population at over 2,000,000. The capital, *Tunis*, the largest city on the north coast of Africa next to Alexandria, has extensive caravan trade with the Soudan.

6. Tripoli belongs to Turkey, as does also *Barca* to the east; in the former *Tripoli* is a city of considerable commercial importance. Both countries are desert except upon their northern border where the proximity of the sea gives the moisture upon which their fertility depends. The coast of Tripoli is lower than that of Barca and in many places is flat, shelving off into shoals beneath the bordering waters. These countries and Tunis were in ancient times the seat of a large, industrious, and highly civilized population, possessing many towns, such as Cyrene, of large size, and one, Carthage, the head of a powerful empire.

EGYPT.

Everywhere in Egypt are seen the evidences of a past power and civilization—the earliest and in many respects the greatest in the ancient world. Sphinx and pyramids are of less importance than the remains of magnificent temples and large cities which abound in the delta and valley, and which, buried in part or in whole beneath Nile mud or desert sand, form the mounds whereon the wretched huts of the modern fellaheen are built.

1. Extent, etc.—Prior to 1884 the sovereign of Egypt claimed authority almost to the Equator; but at present the southern boundary is at Wady Halfa, about 900 miles up the Nile; the area, including the peninsula

of Sinai, is given at nearly 400,000 square miles, with a population of about 7,000,000. But Egypt is practically the Nile valley, which is reached by the inundations of the river; elsewhere it is the sandy or stony desert, with its oases formed by springs or by low mountains.

2. The Nile begins to rise in June, and reaches its height in September. The water is led in trenches over the entire valley and the rich sediment deposited yields in abundance wheat, barley, maize, cotton, millet, beans and rice. Of these cotton is the chief export, followed by beans, wheat and maize. To those parts of the valley that the inundation does not reach, water is elevated by various, often exceedingly primitive, appliances.

3. **Egypt's Trade** in 1884 amounted to nearly £8,000,000 imports, and £12,610,000 exports, two thirds of the whole being with Great Britain. The *Suez Canal*, from Port Said on the Mediterranean to Suez on the Gulf of Suez, has become the great highway of commerce to the East; 3,284 vessels, with a tonnage of nearly 8,320,000, passed through it in 1884; of these 2,474, with a tonnage of over 6,312,000, belonged to Great Britain.

4. **The Population** is exceedingly mixed, but the "fellahs" or peasants form over three-fourths of the whole. Arabs (nomads), Turks, Greeks, Jews and all nationalities are found. The government is a despotism, the Prince, or Khedive, being a tributary of Turkey; Great Britain, however, exercises a kind of protectorate over Egypt.

5. **The Chief Cities** are CAIRO (368,000), the capital, with inhabitants from all over the world; *Alexandria* (209,000), the chief sea-port; *Damietta*, *Rosetta*—both at the mouths of the Nile; and *Mansourah*.

Nubia and eastern **Soudan** (Kordofan and Darfur), lately ruled by Egypt, are mainly in the outskirts of the region of tropical rains, and consequently have a periodical herbaceous vegetation, with few trees except the palm and gum-producing acacias. Northern Nubia, however, is in the desert region, while the part near the Abyssinian mountains has abundant rain and a luxuriant forest growth. The towns are mainly collections of thatched huts, with mud walls in the dry districts: *Dongola* on the Nile, *Suakin* and *Masouah* (owned by Italy) on the coast, and *Khartoum*, a modern-built town of over 20,000 inhabitants, are in Nubia; *El Obeid* is the chief place in Kordofan.

Abyssinia, with an estimated area of 200,000 square miles and a population of over 3,000,000, is a rugged country of high table lands and wild mountain-masses, some of whose peaks rise more than 13,000 feet in air, and into, it is said, the region of perpetual snow. The country rises abruptly from the plains on the east, sinking more gradually to the west. But everywhere the approach to the interior is difficult, the passes being very few, and often walled by perpendicular cliffs.

The rains of the monsoon period, from June to October, give rise to eastern feeders of the Nile, and produce a luxuriant vegetation everywhere, wholly tropical in the lower districts, but in the higher and cooler, as completely European; forest growth is dense everywhere except in the north. The people, who closely resemble the dark-white type, have some rude manufactures: they are, however, mostly agriculturists. A degraded form of Christianity prevails, along with many savage customs. The ruler has the title of king. The towns are *Gondar* and *Adowa*. To the south of Abyssinia lie the Galla country and Somali, both almost unknown, but spices are largely obtained from them. Part of the Somali coast is claimed by Great Britain.

The Soudan, the country south of the Sahara, is better known than much to the south of it. The tribes are numerous and powerful, some of them are warlike and even ferocious, slave hunting being the bane of the region. The Houssas, the most powerful tribe, with whom Great Britain has formed friendly relations, are semi-civilized, having manufactures of leather, cloth, and metal; their towns *Sokoto* and *Kano*, the latter walled with gates faced with iron, are large and have a flourishing trade. *Yauri*, a town of a tribe to the west, has a wall of baked mud twenty miles in circuit;

here the Niger is two miles broad. Timbuctoo, once a centre of Mahometan learning and of a great trade, is now decayed.

South Central Africa away from the vicinity of the coasts is also but little known; the western part almost wholly so except along the routes of a few explorers—Livingstone, Cameron and Stanley. Here the country seems fertile but not very thickly peopled. Of the tribes some are very friendly to strangers, and extremely honest; others are hostile; and still others, degraded and even cannibals. The region of the great lakes has been long frequented by Arab traders from the coast, and has also been often traversed by Europeans, access to the interior here being easier. Many tribes have a considerable degree of civilization, and carry on an important traffic among themselves, and with the Arabs. *Ujiji*, on Lake Tanganyika, is a large market town. The thoroughly despotic kingdom of Uganda, north and west of lake Victoria Nyanza, is populous and powerful.

Congo Free State.—In consequence of late discoveries Great Britain, France, Germany, and other nations entered into an agreement constituting the basin of the Congo a free state which should be neutral and free to all nations,—an area estimated at over 1,000,000 square miles, with a population of 27,000,000. The king of Belgium has been created sovereign or guardian of the state and already settlements have been begun, one, called *Leopoldville*, being at Stanley Pool, an expansion of the Congo 346 miles from its mouth. A European governor and subordinate officers with a small force of soldiers, have been appointed to manage the affairs of the state.

6. **The Coasts** east and west are wholly in the hands of foreign nations except Liberia and part of the Somali country; but besides officials and traders few white people live there. In the Senegambia region, English, French and Portuguese have trading posts. In Sierra Leone, Freetown was founded by Great Britain in connection with the suppression of the slave-trade. Liberia was colonized by slaves from the United States, but has not made much progress; Monrovia is its chief town. All Guinea to the Congo is in the hands of English, French and Germans. Cape Coast Castle, the Cameroons, and Gaboon being the chief posts of each respectively:—here the names Grain Coast, Ivory Coast, Gold Coast, Slave Coast indicate the chief article of trade in these parts. Next follow Portuguese possessions—Loanda, Angola, etc., to Cape Frio, from which to the Orange River, except the English Walvisch Bay, Germany owns, calling it *Lüderitzland* (the Damaraland and north Namaqualand). On the east Sofala and Mozambique belong to Portugal, the chief town being Quilimané. Zanguebar is divided between Germany and the sultan of Zanzibar.

SOUTH AFRICA.

1. **Physical Features.**—The whole of this region is within the rugged terraced slope of the great interior plateau, rising to a general height of 4,000 feet but with elevations over 10,000 feet. To the south of the main range lies the elevated plateau desert, the Karroo which, like the Kalahari, is covered with a rich herbage in the wet season, and is then the resort of countless herds of wild animals. As a rule, the shores are bold and without natural harbors, and the rivers are torrents.

The *climate* is nowhere cold, not even on the high plateaus; but there is a lack of moisture,—only on the lower terraces and, to some extent, the inner side of the Transvaal and Orange Free State, is there sufficient rainfall. Elsewhere the streams are dammed and the water carefully preserved for irrigation. Thunderstorms are very frequent, but other rains are quite irregular.

Forests of excellent timber are found in the moist regions and the gorges or "kloofs" of the mountains, but elsewhere only groves or clumps of bushes, often of a spiny nature, are met with. Lofty plains covered with grass are abundant. There are hardly any native fruits, but all the European grains and fruits, including the vine, have been introduced, and flourish exceedingly well; maize, however, is the chief grain grown. Natal and Zululand grow sugar-cane and the mulberry also in the narrow coast district.

2. Industries, etc.—The outward parts of this region that are arable, are mainly devoted to agriculture, but the grazing of sheep and cattle forms the great industry elsewhere; Angorra goats are also largely raised, and the new industry of ostrich farming, now that wild ostriches have disappeared, has assumed large proportions.



FIG. 84.—OSTRICHES.

The *minerals*—coal, iron, copper, and some gold and silver—are but little worked as yet, but diamonds are eagerly sought for both in Griqualand (in the north) and the Orange Free State. The export trade consists mainly of wool, hides, ostrich feathers, with silk and sugar from Natal and wine and copper from Cape Colony; diamonds to the value of over £2,800,000 were also exported in 1884.

3. Cape Colony, the largest of the British colonies here, has an area of over 250,000 square miles with a population of 1,250,000, three-quarters of whom are natives, the rest being British and descendants of British, Dutch, German and French colonists. The exports in 1884 were valued at nearly £7,000,000. In government, religion, and education Cape Colony is like Canada. The chief towns are *Cape Town* (50,000), the capital, near the famous "Table Mountain," Port Elizabeth, Kimberley, Graham's Town, and King William's Town (British Kaffraria).

4. Natal, the remaining British colony, has an estimated area of 21,150 square miles and a population of about 425,000, all but one-sixth being natives. Cattle, goats, and sheep form the wealth of colonists and natives alike. Durban, the capital, and Pietermaritzburg are the chief towns. The government, etc., are like those of Cape Colony.

Besides the two colonies Great Britain owns, either directly or indirectly, Basutoland (10,290 sq. miles), Bechuanaland (180,000 sq. miles), Pondoland (Kaffraria) and Zululand.

5. The Orange Free State, in government, is a republic of Boers—descendants of the original Dutch colonists who preserve many of the primitive customs of their ancestors. It is almost wholly a level grazing country, but the diamond-fields lie partly within its territory; coal also exists. Blomenfontein is the capital. The area is about 70,000 square miles and the white population over 60,000. Education is low.

6. The Transvaal, or South African Republic, is in all respects like the latter. The area is about 115,000 square miles and the Dutch population over 40,000, it is said. The chief town is Pretoria. Great Britain has a qualified protectorate over these two republics, the blacks being specially under her care.

OCEANIA.

The term "Oceania" is frequently given to the inter-tropical islands of the Pacific and the eastern Indian Ocean, including Australia. The best scientific sub-division of this vast area is that founded on the distribution of the types of Man, (see page 40, sec. 12, par. 1-3), which is accompanied in the two western groups by a decided difference in the lower animal life.

AUSTRALASIA; AUSTRALIA.

Under "Anstraliasia" some include Australia, Tasmania, Melanesia, in whole or in part, New Zealand and Norfolk and adjacent islands; others, only the two first—as is done here; the Australioid being the prevailing or only type of man.

1. Extent.—Australia, a part of the British Empire, is a continent of itself; its area is estimated at about 3,000,000 square miles; from east to west it measures 2,500 miles, and from north to south 1,950. It lies approximately between the parallels of 11° and 39° S. and the meridians of 113° and 154° E. Only the eastern half of the island has been to any extent explored and only the coast regions are settled.

2. Physical Features.—The main axis (see page 8, sec 4), an irregular succession of mountains, known by different names and at a distance of 50 to 150 miles from the coast, is of a varied but low elevation, nowhere exceeding 7,300 feet above sea-level, the height reached by a peak of the Australian Alps in New South Wales. The secondary axis, in general about 250 miles inland, is never over 3,500 feet high; in the interior only low scattered ridges and hills exist; the Flinders range, 3,000 feet high, in South Australia, is the most important of these. The interior, so far as is known, is a low, level plain rather than a plateau, sinking, in the region of Lake Eyre in South Australia, to only 70 feet above sea-level; north of the parallel of 30° and west of the meridian of 140° many wide tracts of desert land are known to exist, while much of the unexplored region is thought to be of the same character.

3. The Coast as a rule is high, and in places bold and rocky, the south varying from 300 to 600 feet in elevation. The outline, except in the north, is very regular; the only great indentations are the Gulf of Carpentaria and the Great Australian Bight; the two gulfs, Spencer and St. Vincent, with Port Philip on the south, and Shark Bay in the west, are important locally. Along the whole north-east coast, at a distance of 20 to 50 miles from the shore, lies an immense, sunken coral barrier-reef, in places over a mile wide.

4. The Rivers in the east, though abundant, are almost all mountain rivers, small and unnavigable; in the other parts of the coast many are found which, though short, are navigable for some distance, such as the *Roper* and *Victoria* in the north. But the chief rivers all flow inward from the main axis,—the *Murray*, 2,000 miles long, and its principal affluents the *Darling*, *Lachlan*, partly dry in the dry season, and *Murrumbidgee*—a deep, rapid river. The Murray empties into a shallow lagoon, called Alexandrina Lake, before reaching the sea; here it is navigable for light-draught boats only; elsewhere it is deeper and navigable. A number of streams of considerable size are lost in swamps and salt lagoons in the interior; scarcely more than salt lagoons are the lakes Eyre and Torrens.



AUSTRALASIA

5. **The Climate**, as physical conditions would indicate, shows but little difference in temperature beyond the natural variation caused by difference of latitude. The lowest winter temperature observed has been 27° ; the highest summer temperature, elsewhere than in the interior, 111° , the point reached when the hot, dust-laden wind from the interior was blowing; the proximity of the sea tempers the heat on the coast. The dry interior has the extreme desert climate. Nowhere, so far as is known, is moisture sufficient except in the east and south-east, that is, where there are mountains. The north is within the region of tropical rains, but although in summer the great heat of the interior produces a vast area of low pressure, only a strip of coast 200 or 300 miles broad feels the consequent inflow of moist air. The rains elsewhere are winter rains. The lowness of the western elevations naturally produces a drier climate in the west than is found in the east; irrigation, therefore, is needed. Snow falls only on the higher mountains, seldom, if ever, on the low land.

6. **Vegetation.**—The forest growth of Australia, nearly all evergreen, has marked peculiarities; the tree fern, the gigantic eucalyptus or gum-tree—the tallest known,—trees with grass-like leaves or whose leaves turn their edges to the sun, trees with no leaves but that shed their bark instead, or whose fruit is wood instead of pulp, are found only here.

The forest regions are chiefly in Queensland and New South Wales; many of the trees yield fine cabinet or other woods; west of the eastern mountains the vegetation is mainly herbaceous; in the dry districts low shrubbery, termed "scrub," often consisting of thorny acacia, sometimes cover extensive tracts of land.

There are no native edible fruits or grains, but all the European varieties thrive well and are extensively cultivated; cotton, sugar-cane, and indigo are largely raised in Queensland and northern New South Wales.

7. **The Animals** are as peculiar as the vegetation, and the fossil remains show that there has been an unbroken continuity of the same species of animal life from remote geological ages such as is seen on no other continent. With few exceptions, the dingo or native dog being the chief, all are low in the scale of animal life, one of the peculiarities being the great number of marsupials, or pouched animals,—the kangaroo, kangaroo-rat, wombat, bandicoot, opossum, flying squirrel, native bear; there are no animals of the horse or the monkey kind, or that chew the cud.

The ornithorhynchus is wholly peculiar. Birds are numerous and beautiful, but there are no songsters; parrots and cockatoos abound, and only here is the lyre-tail found; the emu and cassowary are of the ostrich family. Reptiles also are abundant, many serpents being poisonous; the crocodile grows to the length of thirty feet in Queensland. Food fish are plentiful and good; the hammer-headed shark, especially formidable in Port Jackson harbor, belongs to these seas alone, though its fossil remains are found in other countries.

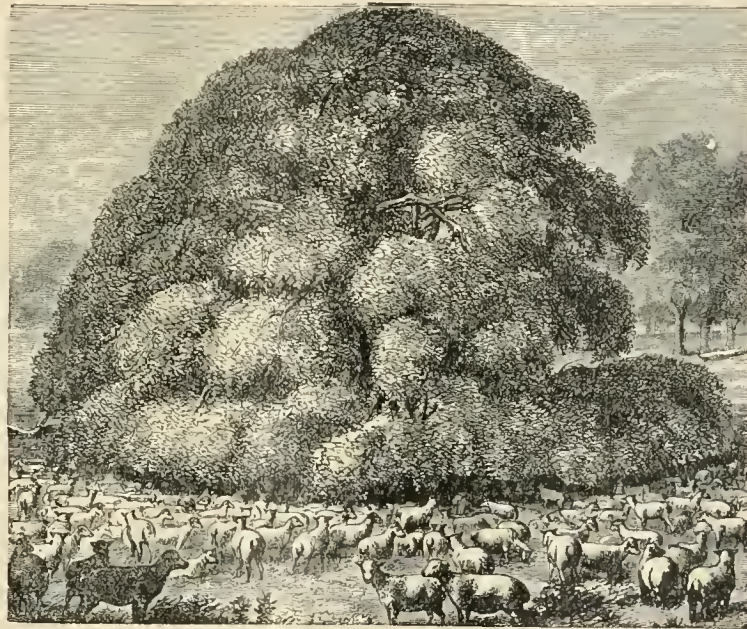


FIG. 85.—AUSTRALIAN SHEEP WALK.

8. **The Native Inhabitants** (see page 40, sec. 12) are estimated at about 75,000, but are fast disappearing. A low, but not the lowest, type of man, they are nomads with but little government, have no cattle, never cultivate the ground, live on roots, insects, fish or animals taken in hunting, build no houses except temporary booths, and have no household goods except weapons; those of the coast or of the rivers have rough canoes and nets for fishing. They have but a faint idea of worship.

9. **Progress and Industries.**—The progress of Australia has been wonderful; the first colony, a most unpromising one in every respect, a penal colony, was established in New South Wales in 1788. Now with a population of nearly 3,000,000, along with all the energy of the mother-land, are found the education, the refine-

ment, the arts and sciences, the self-reliance and the spirit of the mother-land, coupled with the most ardent loyalty and a thoroughly British sentiment.

The great industry of all the colonies is *Pasturage*, especially of sheep; but *Mining* is hardly less important, for Australia is the greatest gold-field in the world; Victoria alone between 1851 and 1884 produced gold valued at £212,000,000; tin, copper, coal, and iron are all extensively wrought. Of almost as great importance is *Agriculture*—wheat, barley, oats, maize, with sugarcane, cotton, indigo in the north-east, and fruits of all kinds, grow luxuriantly. *Manufactures* are important also, but largely connected with the natural industries. *Shipping* is extensive, but *Fishing* is undeveloped. The export *Trade* is wholly connected with the natural industries; wool, preserved meats, hides, tallow, metals, wheat and barley are the leading articles.

The following table gives the names of the colonies with certain statistics of 1883—stock owned, wheat raised, etc., etc.

	AREA.	POP.	SHEEP.	CATTLE.	WHEAT.	EXPORTS.
New S. Wales...	310,700	921,268	34,418,000	1,646,000	4,340,000 bus.	£19,800,000
Queensland.....	658,497	309,913	11,507,000	4,246,000	40,000 "	5,200,000
South Australia...	903,415	312,781	6,677,000	319,000	14,640,000 "	4,800,000
Victoria	87,884	961,276	10,739,000	1,297,000	15,570,000 "	16,500,000
West Australia...	975,920	32,958	1,315,000	64,000	370,000 "	400,000
Tasmania	26,375	130,541	1,831,000	130,000	730,000 "	1,700,000

The colonies all have responsible governments except West Australia, which is a crown colony still.

10. **The Cities** are, in NEW SOUTH WALES, *Sydney* (260,000), the capital, on the harbor of Port Jackson—a fine, English-looking city with many beautiful suburbs, especially *Paramatta*; *Newcastle*, the chief coal centre; *Bathurst*, in a gold region; *Maitland*, "the granary of New South Wales;" in QUEENSLAND, *Brisbane* (36,500), the capital, and *Maryborough* (11,000); in SOUTH AUSTRALIA, *Adelaide* (38,500 in 1881), the capital; *Port Adelaide*, the chief port, and *Port Darwin* in the north, the terminus of the overland telegraph; in VICTORIA, *Melbourne* (325,000), the capital, founded in 1835, a city of phenomenal growth, the largest and finest in Australia; *Ballarat*, in a famous mining district; *Sandhurst* and *Geelong*; in WEST AUSTRALIA, *Perth*, the capital, and *Fremantle*.

11. **Tasmania**.—Tasmania, separated from the sister colony of Victoria by Bass Strait, 120 miles wide, has an area of 26,375 square miles,—about the size of New Brunswick; it is undulating if not mountainous, some of its peaks being over 5,000 feet high. Minerals are abundant.—gold, tin, lead, iron, coal and others—but only gold and tin are mined to any important extent.

The climate, insular in character, is exceedingly temperate, and is highly favorable for all the European fruits and grains, including grapes; and all are raised in large quantities. Forests of most valuable trees cover a large part of the island and furnish important articles of export.

The chief industry, though agriculture and mining are important, is grazing, and the leading export is wool; gold and tin almost equal the wool in value; forest products, green and preserved fruits, and hops, with grain, hides and live stock are also extensively exported.

The population, numbering 130,541, in social and political organization is decidedly British in character; all the natives have disappeared. The chief towns are *Hobart Town* (30,000), the capital, and *Launceston* (17,000).

MALAY ARCHIPELAGO.

1. **Physical Features, etc.**—This division, starting with Sumatra, extends east to a line drawn between Sumbawa and Floris and continued between Celebes and Moluccas to the east of the Philippines. Throughout it the Malay family of the Mongoloid type of man predominates. Physically these islands, as far east as the Bali and Macassar Straits, are the counterparts of Great Britain and Ireland,—they are the elevated portions of a sub-marine plateau nowhere more than 100 fathoms below the surface of the water, and forming a part of the continent of Asia. The close similarity, often absolute identity, between the vegetation and animals of the islands and those of Asia, shows that the separation from the continent has been geologically recent. The island of New Guinea rises from a similar plateau but is connected with Australia, and its types of vegetable and animal life are wholly Australian. Between these two plateaus is a deep sea, the islands of which show more or less, a mixture of the animal life of the two great areas—the eastern being more Australian, the western more Asiatic, but the great Asiatic mammals and the Australian marsupials are absent in both; these islands, however, have types of life (see 9 and 10 below) peculiar to themselves—a fact pointing to long isolation. All the islands of the archipelago, except the small coral ones, are mountainous, but with level or undulating plains also. A string of volcanoes, which often break out with fearful violence, runs along the whole southern and eastern border, and in consequence earthquakes are frequent; the inner islands are free from both volcanoes and earthquakes, so far as is known. Politically the Dutch own, or lay claim to, all these islands except the Philippines and part of Borneo.

2. **The Climate** is the same in all; everywhere with abundance of moisture is tropical heat, the unvarying, though not excessive, character of which is so trying to Europeans.

3. **Forests**, as a consequence of heat and moisture, are magnificent and dense everywhere, the great height and size of the trees and the number of lianas being very remarkable; all are similar to those of the neighboring continent. Native fruits are numerous and excellent: oranges, bananas, plantains, cocoa-nuts; pepper, ginger, nutmegs, cloves, coffee; sugar-cane, betel-nut, tobacco are grown abundantly everywhere, while rice is the staple food in all parts except in the east, where sago takes its place. Sugar, coffee, spices, sago and the metals are the exports to foreign countries.

4. **The Animals** (see page 38, sec. 7) include all the large types of the Indias, together with serpents and birds, but in the east alone are found the gorgeous birds of Paradise and Australian cockatoos. Bird and insect life are here in their utmost brilliancy and variety.

5. **The Economic Minerals** are all found : *gold* and *tin* are everywhere mined, *coal* and *copper* in Borneo, *antimony* and *sulphur* in several islands, while *iron* is comparatively untouched.

6. **The People.**—The typical Malay differs but little from the typical Mongoloid ; he is apathetic, dilatory and undemonstrative, averse to quarreling, reserved, sensitive regarding personal liberty, kind, especially to women and children, but capable of the utmost cruelty and ferocity. They are good sailors ; some of the tribes were, and are still, pirates ; they are keen traders, and though deficient in intellect have considerable civilization and an important literature. In religion most of them are Mahometans. There are many varieties of the Malays and many mixed tribes, and as many languages. In the east there are Papuans of several kinds also. Chinese and Arabs are largely settled throughout the islands.

7. **Sumatra** is 1,025 miles long and 240 broad ; the greater part, not fully explored, is still forest. The Dutch have a protectorate over part, and directly govern the rest. The people, between 2,000,000 and 3,000,000, have much skill in making gold and silver filigree work, silk and cotton goods, and earthenware. Pepper is the great export from Sumatra. The chief of the Dutch settlements are *Bencoolen* and *Pedang*.

8. **Java**, the finest and most important tropical island in the world, has a length of over 600 miles, with a maximum breadth of 170 miles, and the remarkably dense population of fully 21,000,000. The Dutch government claims nearly all the land, and the people are agricultural laborers, who in addition to their rice, fruits, etc., are compelled to cultivate so much coffee and sugar-cane, and to sell to government alone at a fixed low rate. There are many large towns in Java, chief of which are *Batavia*, the seat of government, *Samarang*, and *Sourabaya*.

9. **Borneo** is twice the size of all the British Islands, but the extent of the population, though great, is unknown ; only here and in Sumatra is the orang-utan found. The Dyaks, the chief native tribe, are much higher in intellect and character than the other Malays. The Dutch claim large territory south and west ; the English own Sarawak and have authority over the north-east, where a company is working mines and raising sugar-cane.

10. **The Celebes**, a strangely-shaped island 70,000 square miles in area, across the strait of Macassar from Borneo, is but little known except where the Dutch have stations. Its scenery is described as magnificent ; rice and coffee are the chief commercial products ; the babirusa, or pig-deer, and the sap-utan, or wild cow, are the wholly peculiar wild animals. *Macassar* is a large, neat trading town in the south-west.

11. **The Philippines**, which with the Sulu archipelago to the south belong to Spain, comprise over 1,400 islands, in area about 114,000 square miles, with an estimated population of nearly 6,000,000. The islands are greatly exposed to the destructive typhoons of these seas. The peculiarly Philippine commercial products are the famous tobacco and Manila hemp ; the trade in these is very important. *Manilla* is a large town on the northern island. The negritos are a diminutive race of blacks resembling the Bushmen of Africa, but with some Papuan characteristics.

MELANESIA.

1. **Extent, etc.**—This group, wholly south of the equator, extends from the Malay Archipelago south-east to Fiji and the tropic of Capricorn ; Australia, though

improperly, is sometimes included in it. In these islands the Negroid type of man is the only one found, but its modifications are numerous and important, the Papuan modification being the most distinctive (see page 40, sec. 12). The Papuan differs markedly from the Malay : he is of medium height, black, bearded and hairy-bodied, shock-headed, with large, prominent and hooked nose ; excitable, impetuous, noisy ; joyous and laughter-loving and, as a rule, honest. The Papuans have much mechanical and ornamental skill, and though intellectually superior to the Malays have but little approach to civilization ; many are known to be cannibals and are very fierce.

These islands differ little in physical characteristics, climate or productions from the Malay group, except that Timor and others near it, have the dry Australian climate to some extent, and New

Guinea has some Australian trees—the eucalyptus and others. But the animals are different, all are of the Australian type : very few of the higher types exist, and these are the lowest of the kinds—marsupial animals ; mammals are very few ; but birds are numerous and gaudy in color—birds of Paradise, the lyre-tail, cockatoos, etc.

The islands west of New Guinea,—*Florida*, *Timor*, *Ceram*, *Gilolo* (in the Molucca group),



FIG. 86.—PAPUAN.

Timor Laut, the *Aru* group and others, do not differ materially from New Guinea ; bread-fruit, however, does not grow in them.

2. **New Guinea**, the largest island in the world, is 1,490 miles long, 430 broad, with an estimated area of 306,000 square miles. The interior is unknown, but from the coast it appears mountainous ; the shores are often steep, but often also low and swampy. Coconut palms abound and the bread-fruit here becomes a chief food as in all the Pacific islands. The tree-kangaroo is an animal peculiar to the island. The Dutch claim the west coast, but Great Britain has established a right to the south at least, and Germany claims the east.

3. To the east lie the large islands of *New Britain*, *New Ireland*,—both lately taken possession of by Germany,—and the *Solomon* group ; all are volcanic and high, with the usual productions. But with the last group end the marsupial animals ; animal life, except water-fowl and insects, is rare to the east of the Solomon Islands.

4. **Fiji**, situated, approximately, on the meridian of 180° and the parallel 20° S., consists of two large and about 200 small islands, in area 7,740 square miles, all oceanic in character. The moist tropical climate, with the rich volcanic soil, gives rise to a profuse vegetation, including fine forest trees, cocoa-nut and sago palms, bread-fruit, bananas, plantains, pine-apples, sugar-cane, maize, arrow-root, and the yam—the chief food; these, except the bread-fruit and yam, supply the exports, sugar and molasses being the chief. The Fijians, about 112,000 in number, are a superior type of the Papuan race; they possess much skill in house-building, and their implements show excellent adaptation to their purpose. They are now all Christians; all the children attend the mission schools, which with few exceptions receive no state aid. Fiji is a crown colony of Great Britain. The Europeans number about 4,000.

5. **The Tonga or Friendly Islands**, east of Fiji, consist in part of lofty volcanic islands, and in part of elevated coralline limestone, some of the hills being 600 feet high. The people are regarded as the highest of the Pacific island races; many of the arts of the Fijians have been learned from the Tongans; and now that the Tongans have become Christians, many of them are employed as missionaries to the other islands.

6. **The Samoa or Navigator Islands**, and the Society Islands (owned by France), the lovely Tahiti being the largest of the group, do not differ materially from Fiji.

7. In the oceanic **Marquesas and New Hebrides** groups, and in **New Caledonia** climate and productions are like those of Fiji, but the people are much lower and ruder than the Fijians. New Caledonia is of volcanic formation, 240 miles long and 25 broad. It has many minerals, nickel being largely mined. As it is a penal of France it makes no progress. Erromanga and Aneiteun of the New Hebrides have been christianized by Nova Scotia missionaries; in the other islands the people are savages.

MICRONESIA.

This group consists of the islands north of Melanesia between the equator and the tropic of Cancer. They are mainly coral atolls except the volcanic *Ladrone Islands* in the north; these and the *Caroline Islands*, both of which belong to Spain, are the chief groups. The people are lighter in color than the Melanesians, and more of the Malay type of feature. They are peaceable, kind to strangers when well used, intelligent, expert in the use of boats, and excellent fishers. Animals are few in number.

POLYNESIA.

1. **Extent, etc.**—This division includes all the other Pacific inter-tropical islands together with New Zealand. The Polynesians, a rather tall race, resemble the Malays in features, but the Melanesians in many mental characteristics. Intellectually they are higher than the Melanesians, and of a gentler nature, and have been comparatively easily led to embrace Christianity. The groups in the southern half of this area are mainly volcanic; elsewhere they are coralline; some of the latter are elevated, others are low, or atolls. In climate and productions they resemble Melanesia.

NEW ZEALAND.

2. **Physical Features.**—The colony of New Zealand, situated about 1,200 miles east of Australia, has an area of nearly 100,000 square miles. It consists of two main islands, North Island and South Island, separated by Cook Strait, along with the small Stewart Island south of Foveaux Strait. The greatest breadth is 150 miles.

The islands are essentially mountainous, but wide undulating plains occupy the west of North Island and the east of South Island; in the latter island Mount Brown reaches the height of 12,349 feet, far above the snow line. Volcanoes and volcanic phenomena occur, especially in North Island near the Bay of Plenty, where by the eruption of Tarawera in 1886—a supposed extinct volcano,—great destruction of life was caused, and a marked alteration in the country adjacent produced. In the same region are very many hot mineral springs and small geysers; and here a government sanitarium, Rotorua, is situated. Here also is the hot lake Taupo, and its outlet Waitako (hot) River, the largest stream in New Zealand.

3. **The Coast** is very irregular, with many excellent harbors; the chief indentations are *Bay of Plenty* and *Hawke Bay* in North Island.

4. **The Climate** is naturally equable, resembling the moist Mediterranean climate of Europe in the North Island, and the climate of southern England elsewhere.

5. **The Vegetation** resembles that of eastern Australia, and forests of fine, but hard, wood abound everywhere; native grasses and flax are of excellent quality. There are no native fruit trees, but European fruits and grains are widely cultivated.

6. **Animal life** is very meagre, all higher types are absent; the Kiwi, or Apteryx (wingless), is a bird of the ostrich family. Few edible native fishes exist; but European varieties as well as domestic animals have been introduced.

7. **The Industries** are the same as in Australia—grazing, especially of sheep, agriculture, and mining of gold and coal, for New Zealand is an important gold-field. Manufactures are considerable, consisting of woollens, leather and leather goods, agricultural implements, machinery and dairy products. The exports are wool, preserved meats, animal products generally, wheat, timber and gold, gum and dairy produce,—valued at over £7,000,000 in 1884.

8. **The Population** in 1885 was 572,000 colonists, and 55,900 Maoris, or natives. The latter are dark Polynesians, intellectual, athletic, and show a marked capability of adopting European civilization. The land in the colony that was not bought by government or settlers belongs to them. In education, enterprise and progress New Zealand is equal to the best of the Australian colonies.

9. **The Chief Towns** are Wellington (22,000) the capital, Auckland (40,000), Dunedin (15,000), and Christ Church (33,000).

The Sandwich or Hawaiian Islands are mountainous and volcanic, containing the great volcano Mauna Loa. The climate is very salubrious, and along with the usual productions, wheat and other grains are raised. The people are christianized, civilized and educated, and have a constitutional government. There are many foreigners in the island, chiefly Chinese, Portuguese, English and Americans—the last being especially influential. Honolulu is a large, thriving town, the port of call for steamers going across the Pacific. The area is 6,677 square miles; the native population, about 45,000, is rapidly diminishing. Sugar, rice, coffee, wool, and whale oil are exported.

Norfolk Island is an oceanic island of about 14 square miles in size, with bold almost unapproachable shores. The people are mainly Pitcairn Islanders—descendants of English fathers and Polynesian mothers.







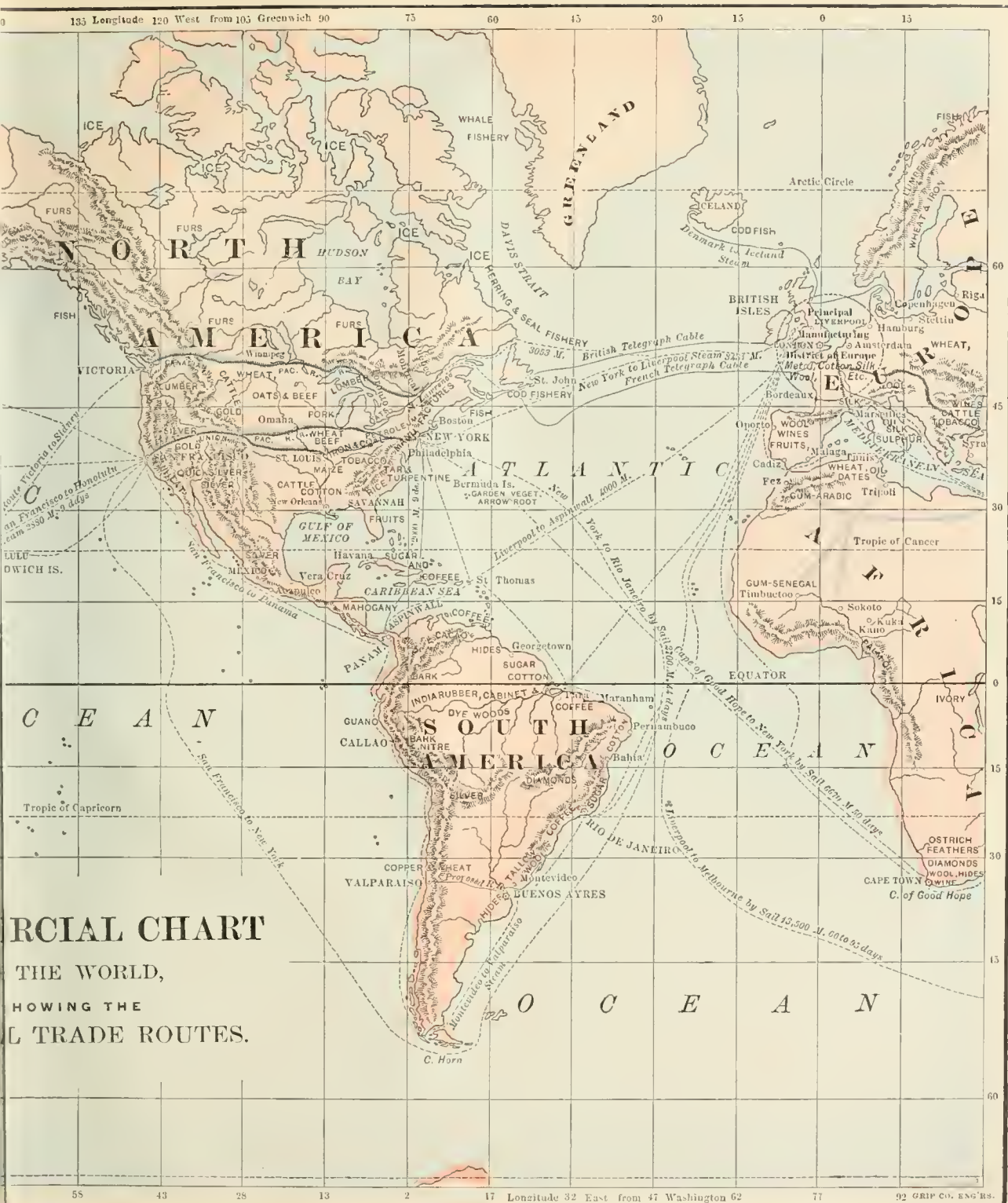


ANCIENT GREECE
With Adjacent Islands
AND
WESTERN ASIA MINOR









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